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11. Library development plan with a draft library bill for Bombay, 1947
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14. Library book selection, 1952

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15. Colon classification, 1933, 1939, 1950
16. Prolegomena to library classification, 1937
17. Library classification : Fundamentals and procedure, 1944

18 Elements of library classification, 1945

19. Classification of Marathi literature, 1945
20. Classification of Telugu literature, 1947
21. Classification and international documentation, 1948
22. Classification, coding and machinery for search, 1950
23. Philosophy of library classification, 1951
24. Classification and communication, 1951

Cataloguing

25. Classified catalogue code, 1934, 1945, 1951
26. Theory of library catalogue, 1938
27. Dictionary catalogue code, 1945, 1952
28. Library catalogue : Fundamentals and procedure, 1950

Reference Service

29. Reference service and bibliography, 1940

Administration

30. Library administration, 1935

Academic Libraries

31. School and college libraries, 1942
32. Library development plan for the University of Allahabad, 1947
33. Organization of libraries in India, 1946

Bibliography

34. Bibliography of reference books and bibliographies, 1941

SOCIAL BIBLIOGRAPHY
OR
PHYSICAL BIBLIOGRAPHY
FOR
LIBRARIANS

S. R. RANGANATHAN

UNIVERSITY OF DELHI
DELHI
1952

DELHI UNIVERSITY PUBLICATIONS

LIBRARY SCIENCE SERIES

1. Ranganathan (S. R.). Preface to library science. 1949.
2. Ranganathan (S. R.). Library development plan with draft library bills for the Union and the Constituent States. 1950.
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TO

S. PURUSHOTTAMA AYYAR

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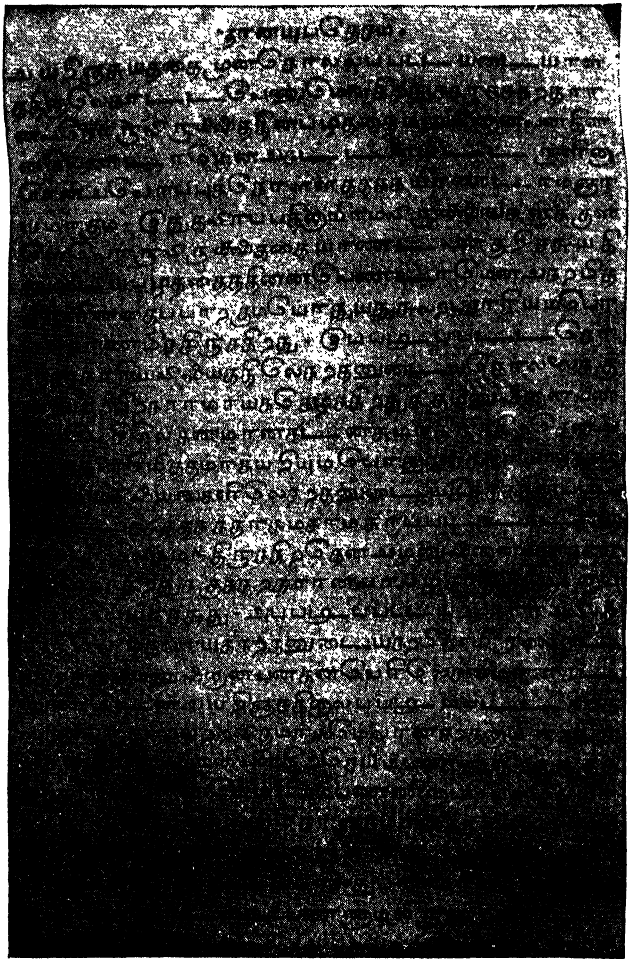


Specimen page of Gnanobadesam
an Ambalakkadu Tamil Book

CONSPECTUS

This is one of three books that are coming out together: (1) *Social education literature*, (2) *Library book selection* and (3) *Social bibliography* or *Physical bibliography for librarians.*

Of these, the first book is turned mainly on authors, publishers and governments. It endeavours to formulate some principles which can be of guidance to the "new voices" which new India is throwing forth in the unfoldment of her renascence. Without any intention of affecting the spontaneity which is of the very essence of true writing, it presses on the attention of authors the great social purpose which the writings of today are destined to serve. It also discusses how the publishing partner should do his work to make books acceptable to the whole spectrum of readers from the neo-literates onwards. Lastly it examines how the lateness of the awakening of India finds her in an age which has left laissez-faire almost a century behind, which calls for planned, steady action in almost every sphere which affects the life, not only of the community as a whole, but whenever unavoidable, even the life of individuals. From this angle it formulates principles of policy which the governments in the country should implement.

This book may be described as a book on books from the angle of the producer of the thought embodied in them.

The second book, which has already come out, is turned on librarians and library authorities. It endeavours to formulate some principles which can be of guidance in the selection of books for libraries of various kinds. It derives these principles systematically from each of my five Laws of Library Science. It shows also what additional principles —organisational as well as administrative—are imposed on book selection policy by limitations of finance. After a brief chapter on sources for book selection, the book concludes with a chapter on the routine of book selection extracted from my *Library administration* (Madras Library Association, publication series, 4), 1935.

This book may be described as a book on books from the angle of the distributor of the thought embodied in them.

The present book, which is the third, assumes many of the details worked out in the first two. The fact that the other two books are coming out simultaneously is utilised for making this book briefer than it would have been otherwise. This also implies that, for the fullest information, the three books should be read together.

In this sense this belongs to a small family of books.

In another sense it belongs to a much larger family. Indeed anybody can easily trace its ancestry to the first member of the family, the *Five laws of library science* (Madras Library Association publication series, 2), 1931. That book contains, in little, practically everything which is found more elaborately elucidated in all the succeeding books of the family. I owe this large family of books to

Edward B. Ross, my professor, who initiated me in the art of thinking in the six years he taught me mathematics. His development, not only of the lectures in the classes on any particular subject, but even of every conversation I have had with him — I have had them from 18 March 1909, the year in which he captured my mind, to 14 April 1932 when he retired and went back to his home-country — has produced a lasting impression on my mind. That impression had been given a name by another respected friend of mine Mahamahopadhyaya Professor S. Kuppuswami Sastriar. That name is *Ekavakyata* (=Unity). He used to say that all knowledge was one. The Vedas form, in a sense, a single sentence. So does every chapter of it form a single sentence ; and of course every sentence in it is a single sentence.

When Providence transferred my field of interest from Mathematics to Library Science, this *ekavakyata* tradition of the Vedic ancestors, demonstrated in daily life by my Professor, came with me. When I spent a year wandering amidst diverse libraries in Great Britain in 1924-25 to prepare myself for my new life, the light of this *ekavakyata* principle was disclosing the minutest imaginable details in library practice. It illuminated each of them, and at the same time threw them into a coherent whole. I felt the *ekavakyata* pervading all that I saw in the British library world and all that I read in the splendid library on Library Science found in the School of Librarianship of the

University College, London. I still find it guiding me in all my thought and life. I often realise that even apparently trivial occurrences are organically fused into a single life-experience. Occasionally when immersed in thinking out ideas, all the long years of life fuse into a single moment. Such is the potency of *ekavakyata.* It has helped me to realise the profoundness and the supreme truth embodied by Francis Thompson in the rapturous lines forming stanza 21 of his *Mistress of vision*:

> All things by immortal power
> Near or far,
> Hiddenly
> To each other linked are,
> That thou canst not stir a flower
> Without troubling of a star.

I have described in my *Preface to library science* (Delhi University publications, library science series, 1), 1949, the struggle I have had in giving expression to this feeling, the help which my Professor once again gave me in overcoming the struggle, and the great release I had when the *Five laws of library science* finally took shape in mind. That book is a verbal record of the *ekavakyata* of library practice and science, as it revealed itself to me. As stated already, each one of my later books has come out as but an elucidation of whatever is contained in the first book. It is in this way that the family has been developing. They have developed along different lines—into different sub-families. There has been considerable in-breeding among them. The result is that some friends find apparent repetition in several books and at the same time others find some elements of incompleteness in them. This book also may appear differently to different people. This is unavoidable when we look at a member of the latest generation of a family and compare him with the others. It naturally embodies the features of all its ancestors. From the first ancestor downwards all the books of this group have family resemblance, each with its own individuality but bringing out, now more now less, of this or that capacity or characteristic of the original ancestor.

The three books which are now coming together had been crowded out all these years by others claiming greater attention and also delayed since circumstances made me give up teaching these subjects from 1937 and helped me to resume the same only in 1947. Five years of teaching the subject in the present second round has encouraged me to fulfil a long cherished wish to pursue the Laws of Library Science even outside its premises, so to speak.

The facility to live this particular branch of the subject once again, I owe to Sir Maurice Gwyer, one of the greatest friends of Education and Library Science I have known. It was his invitation to come to Delhi and his establishing a Department of Library Science which provided this facility to me. Pursuit of other branches of Library Science in Delhi was but a continuation of the thinking that had taken some shape prior to coming to Delhi.

No doubt this pursuit took me into levels of greater and greater charm. But the present book marks a new line of pursuit which I was unable to explore till teaching the subject at the University of Delhi opened it up for me. For it is only contact with growing minds that generates the glow necessary to light up any line of intellectual pursuit.

Chapter 0 defines the scope of this book and the line of pursuit followed. It starts with describing bibliography as a means of communication and isolates the various senses in which this term is used. It finally arrives at the definition of Social Bibliography.

Chapter 1 views Social Bibliography from the angle of the First Law of Library Science. It traces the evolution of writing material from stone to paper. It gives a brief history of paper-making and of machinery for paper-making. It also traces the history of paper-making in India and concludes with the message of Social Bibliography in regard to paper.

Chapter 2 examines Social Bibliography from the angle of the Second Law of Library Science. It traces the evolution of printing from block-printing in China to the offset-printing of today. It gives a brief history of printing and of the machinery used at different stages of printing. It also traces the history of printing in India and concludes with the message of Social Bibliography in regard to printing.

Chapter 3 examines Social Bibliography from the angle of the Third Law of Library Science. It discusses the aesthetics of the printed book. It gives a brief history of the jacket, half-title page, title page and type face. It then deals with the problem that India has now to face in regard to the aesthetics of the printed book to make it acceptable to the neo-literates. It concludes with the message of Social Bibliography in regard to the harmony of the printed book.

Chapter 4 examines Social Bibliography from the angle of the Fourth Law of Library Science. It discusses the lay-out of the book and details like page-heading and section-heading. It also traces the evolution of the preliminary pages and of the index down to the "Expressive Index." It then traces the history of the title page among Indian books. It concludes with the message of Social Bibliography in regard to title page and index.

Chapter 5 examines Social Bibliography from the angle of the Fifth Law of Library Science. It takes a peep into the future of the form of the book and mentions the modern photo-mechanical processes of reproducing books. It also traces the effect of the increasing rate of book production on binding. It concludes with the message of Social Bibliography in regard to the co-ordination of the National Central Library with the State Central Libraries in India.

Chapter 6 is on paper making. It gives an account of the primary materials out of which paper is made, of the process of transforming the raw material into pulp and into paper, and finally of the process of finishing. It has sections on sizes and varieties of paper. After a brief discussion of the position of paper making in India, it concludes with the way in which a knowledge of paper making will be of help in the day to day administration of libraries.

Chapter 7 is on printing. It gives an account of typography, composition, imposition, printing and illustrations and publisher's casing. After a brief account of the problems which face India in regard to printing, it concludes with the way in which a knowledge of printing will be of help to the librarian.

Chapter 8 is on binding. It describes the book as a chain of several links, it gives an account of the process of binding and of the covering materials. It gives also a specification for re-inforced library binding.

CHAPTER 0

FIELD OF STUDY

There is a considerable play of homonyms and synonyms in the field of Bibliography. We shall therefore first examine the various concepts falling within the purview of the term Bibliography and draw the boundary line for the particular field of study to which this book is devoted. All the concepts fall, however, within the sphere of Communication. The domains in communication have been analysed in my *Classification and communication* (Delhi University publications, library science series, 3), 1951.

01 Communication

Communication is of the very essence of human existence. Man can not long live in isolation. Men have to lean on one another to get their food, clothing and shelter in order to keep their body in happiness (=*Sukha*). They have to associate with one another to escape boredom and get emotional satisfaction. They have to think together and do their thinking in unison in order to sharpen their intellect and to get mental joy, (=*Pramoda*). The man who apprehends things-in-themselves, directly and unmediated by senses and intellect, sees the universe as a whole and each part of it also as a whole in its infinite spatial and temporal context and revels in spontaneous self-born delight (=*Ananda*), radiates his delight and wisdom over others, and the others have to lean on him for their own delight to get stimulated. To get happiness, joy and delight, men have to communicate with one another. Communication is necessary for their satisfactory and efficient living in all the five planes—physical, vital, emotional, intellectual and spiritual planes. Men in the highest reaches of the spiritual plane communicate by radiation, direct thought-transfer perhaps, quite unmediated by aid of any sort—sans gestures, symbols, sounds, words, writing, printing or books.

011 MEDIUM

Men in the normal levels of mental existence communicate with the aid of gestures, symbols, sounds, words, and written and printed books. The first four media of communication limit the range of time and space that can be covered. In time it is momentary and in space it is limited by visibility or audibility. The last two media make communication transcend the limitations of time and space. These media may be said to transform the thought to be communicated into physical entities called Books, and make it fit for transport across space and through time. In this physical form, thought is carried from any point to any other point on earth and it is also preserved for any length of time. A man in Delhi thereby communicates with a man in Washington. I communicate even my fleeting thought to Luther Evans by writing; and he reciprocates. I communicate my more lasting thought to him and to my other colleagues in America through books ; and they reciprocate. The thought of the great Sankara has been preserved and communicated to us through books ; and we pick it up. The thought of the thinkers of today is similarly embodied in books and it is thus rendered fit for communication to the endless generations to come ; and they will pick it up.

012 AUTHORIAL ART

Linguistics, authorial art and fine arts are concerned with the transformation of thought prior to the physical act of writing and printing. They deal with the subtle embodiment of thought.

013 PHYSICAL MEDIUM

The art of writing, printing and publishing deals with its gross embodiment. Bibliography has to do with the mode of communication inherent in human society, in so far as it concerns writing, printing and books—the physical medium. In this book, we shall confine ourselves to printed medium.

02 Bibliography

Even within the sphere of printed medium, Bibliography is a term which has had and still has several meanings. First it denoted the physical process of writing or transcribing books, as distinct from the intellectual or intuitive process of composing books *i.e.*, creating or building up their thought-content and clothing it in a language or any other subtle medium as a first step in communication. It was later made to denote also composition of books. It was the French who first enlarged its meaning in this way. Ebert, the German bibliographer, extended the definition to "In the greatest sense, the science that deals with the literary productions". This led to the definition "the science of books". This definition passes the problem on to the term "Book".

020 BOOK A TRINITY

Book again is a composite concept. When the term 'Book' is uttered, it may bring to mind one or more of several ideas. The ideas suggested by the term may vary from person to person and even, in the case of one and the same person, from context to context.

When we say that the *Gita* is a seminal book (=*Prabhu sammita* as explained in my *Library book selection*), the term "Book" means only the *thought* communicated by it.

When we say that George Gamow's *Inside the atom* is a lucid book with helpful illustrations (=*Kanta sammita*), the term "book" refers to the style, the clarity and the simplicity of the language and the aptness, expressiveness and revealing nature of the pictorial aids and diagrams, in short, the *subtle medium* through which the thought is communicated.

When we say that every book produced by Nonesuch Press is beautiful, the term "book" refers to the excellence of the binding, the typography, the reproduction of illustrations, the quality of the paper and the over-all appeal to the eye, in short, the *physique* on which the subtle intangible medium is impressed and the thought is embodied.

Again when we say, "That exhibition of books on Arithmetic from Vedic age to our own days shows the long way Arithmetic has passed", the term "book" denotes its soul (=thought-content) and nothing more.

On the other hand, when we say, "That Bible exhibition is one of the most interesting exhibitions of books we have had. What a variety of books! It looks as if there is no language of the world which goes unrepresented", the term "book" refers only to the subtle body (=linguistic medium).

Or again, when we say "The books in the exhibition held by the Bibliotheque Royal at Brussels in 1930 showed the beauty of the tooling and of the binder's workmenship in the sixteenth century", the term "book" refers only to the gross body(=physical medium)—its look and particularly its exterior.

A book may, then, be taken to be a trinity of soul (=*atma*), subtle body (=*sukshma sarira*) and gross body (=*sthula sarira*). In association with each of these members of the trinity, the term 'Bibliography' gets a different meaning. Even when associated with any one of these members, the meaning of the term, changes with purpose. We have to distinguish the various meanings by prefixing to the term, 'Bibliography' a qualifying epithet setting forth its kind.

021 SUBJECT BIBLIOGRAPHY

When "Bibliography" is dominantly associated with the soul of books, we call it "Subject

Bibliography." Subject bibliography may mean a list of embodied macro and/or micro thought—*i.e.*, of books and/or articles in periodicals—on a specialised subject or on any number or on even all subjects, When it is prepared so as to meet the requirements of advanced specialists, it is called Documentation List. Subject bibliography may also mean the art of preparing such a list. Corresponding to this we have also the term Documentation Work.

An example of a subject bibliography in the first sense is my *Bibliography of reference books and bibliographies* (Madras Library Association, publication series, 10), 1941. It lists hundreds of reference books. It also lists subject bibliographies. T. Besterman's *World bibliography of bibliographies* (1939-40) in two volumes aims to make a full list of subject bibliographies. William Jaggard's *Shakespeare bibliography* (1919) of 756 pages, Montgomery Schuyler's *Bibliography of Sanskrit drama* (1906) of 120 pages and R. N. Dandekar's *Vedic bibliography* (1946) of 398 pages are Subject Bibliographies. The annual volumes of *Library literature* constitute a subject bibliography coming out annually as a serial.

Subject bibliography in the second sense has been expounded in part 4 of my *Reference service and bibliography* (Madras Library Association, publication series, 9), 1940.

022 LINGUISTIC BIBLIOGRAPHY

There are also bibliographies which list reading materials in a specific language *e.g.*, T. Aufrecht's

Catalogus catalogorum is a bibliography of Sanskrit manuscripts. The revised edition in preparation at the University of Madras aims to list also the printed editions of the manuscripts. These are Linguistic Bibliographies. The catalogue of the British Museum Library include many volumes of linguistic bibliographies—devoted to Sanskrit, Hindi, Marathi, Gujarati, Arabic, Persian, Urdu, Tamil, Malayalam, Kanarese and Telugu.

023 EXPOSITIONAL BIBLIOGRAPHY

There are also bibliographies of books which are in the form of essays. Wilson's *Essay and general literature index* (1934—) is an example. Here are examples of bibliographies of books in other forms of exposition:—

A. H. Cole's *Finding list of Royal Commission reports in British Dominions* (1930) of 134 pages.

P. M. Riches's *Analytical bibliography of universal collected biography* (1930) of 709 pages.

T. Chubb's *Descriptive list of the printed maps of Norfolk* (1928) of 208 pages.

There may similarly be bibliographies of books in other forms of exposition.

Here also bibliography may mean either the list or the work of preparing it. We may call such a bibliography, which lists books with a specific expositional feature, by the common name Expositional Bibliography.

024 ENUMERATIVE BIBLIOGRAPHY

A generic name for Subject and Expositional Bibliographies is Enumerative Bibliography. This latter term may also denote any list of books, articles and kindred reading materials, prepared by any agency for purposes of its own. Twelve possible agencies have been isolated in my *Reference service and bibliography*. They had been thrown into five groups and these had been arranged in the form of the economico-bibliographical array:—

Producers (thought) (=Authors)
↓
Producers (physique) (=Printers and Binders),
↓
Distributors (physique) (=Publishers, Copyright Authorities, and Bibliophiles)
↓
Distributors (thought) (=Book selection authorities, Library cataloguers, and Reference Librarians)
↓
Consumers (thought) (=Readers including authors in particular).

The list of published materials produced by any of these agencies is an Enumerative Bibliography.

Here again bibliography may denote the work of preparing any of these kinds of lists.

This book is not concerned with Enumerative Bibliography in any of its senses.

025 Existence Bibliography

The primary purpose of the bibliographies prepared by all the agencies mentioned in Section 024 is to make available a list of books known to exist in a certain library or else in a certain field of study such as a definite period of time or a specified subject or a given language or a certain form of exposition or an individual author and so on. Noting the existence of books exhausts the purpose of such a bibliography. We may therefore call it an Existence Bibliography. Ordinarily the entry of a book in such a bibliography will give only the minimum of details to identify it, say, name of the author, title, date and series, if any, to which it may belong. In certain Existence Bibliographies such as copyright lists or publishers' bibliographies, the place of publication, the name of the publisher, the format and the collation may also be given. In preparing some of the lists, the person who produces the bibliography may or may not examine the book personally. No effort is made to describe the physique of the book in detail, except in so far as it is inseparable from location-requirements. In the *Merchant of Venice* Antonio pledged a pound of his flesh. Shylock earned a right to it. Portia's insistence that Shylock should take the flesh without a drop of Christian blood was a trickery. We have a proverb in Tamil that if a cow is sold, the buyer is entitled to the calf. In a similar way some slight account of the physique of the book is an inseparable concomitant in any Existence Bibliography. But the physique does not occupy the centre of attention.

03 Physical Bibliography

When Bibliography is concerned only with the gross body or physique of the book, we may call it Physical Bibliography. This deals with the process of production of a book in a printed or other kindred form. This will have to deal with:

(1) Paper ;
(2) Type-casting ;
(3) Printing ;
(4) Illustrations ;
(5) Binding ;
(6) Parts of a book ;
(7) Description of a finished book ; and
(8) New physical forms in which books are now being reproduced, say, by photo-method.

There are three angles from which these topics may be studied. They can be studied as for:

(1) Craftsmen and technologists engaged on paper-making, printing and binding ;
(2) Scholars engaged in textual criticism and for this purpose in the evaluation of the authenticity of copies of a book, the dates of production and the changes in successive embodiments of the same work, and the differences among the copies produced at the same time; and
(3) Librarians acting as distributors of embodied knowledge for the social purpose of helping the further self-education of the specialist as well as the common man and for providing facilities for intellectual self-entertainment.

04 Technocracy in Production

The production of the physical book calls for a team of craftsmen to work-in-series: (1) Paper-maker, (2) Type-caster, (3) Block-maker, (4) Printer, and (5) Binder. As in all other trades, the workers in these groups first began as craftsmen. These depended on their own individual skill and did all the jobs mostly by themselves. They learnt their craft by apprenticing with master-craftsmen. The work was on a small scale. It belonged to the class now called cottage industries. In due course, their scale increased. Machinery progressively replaced manual labour. The work reached the class now called manufacture or large scale in-industries. Production passed on from craftsmen to technologists. It became a matter for chemists and engineers. It got so specialised that it called for further diversification. Industrial chemist, cellulose chemist, size-chemist, colour-chemist, paper-chemist, leather-chemist, machine-maker, power-engineer, machine-man and so on. It also called for entrepreneurs who secure maximal efficiency and for this purpose search for, manage and conserve raw materials, capital, scientific and technical man-power, labour, and wholesale and retail distribution. It became a matter of technocracy. This book is not concerned with such technological interests. There are technical books in the field to serve these interests. These are too specialised for a librarian. What he wants is a simple descriptive account of the materials and processes involved and perhaps some account of the landmarks in their history, so as to enable him to choose between good and bad among finished materials, to handle them with confidence, to know the ills to which they are prone, to take preventive and curative measures, to know when to call for specialists in regard to these measures, to be able to report to technologists in correct terms the findings of his own profession in regard to the improvements found desireable in the making of the materials, and to deal with the producer as an interested and intelligent consumer or distributor.

05 Palaeo-Bibliography

Let us remember that a book is a medium of communication. Faults and frauds are possible in the medium. These should be detected and corrected or allowed for in picking up the communication. When the original producer of the thought, which is communicated through a book, belonged to a past age and is dead and gone, there is no chance for getting to know his mind and intention by direct personal intercourse. His thought has to be reconstructed as best as possible from what is expressed in the book. In this reconstruction, there are two stages. The expression in the subtle medium should be re-transformed into thought. This needs competence in linguistics and scholarship in the subject-matter. But prior to the retransformation of the recorded words into thought, it must be ensured that the recorded words are authentic in the particular copy which serves as the physical medium. It must be ensured if:

(1) the printer had not inadvertently introduced anything not meant by the author ;

(2) the printer had not deliberately made any changes in the subtle or the gross body, with or without fraudulent intention ;

(3) any of the persons, through whose hands the copy might have passed, had made any alteration intentionally or unintentionally ; and

(4) in case the copy is that of a later edition, any of the persons connected with its production had not made deviations from the first edition, intentionally or unintentionally.

To pick up the communication correctly, every effort will be made by a meticulous scholar to guard himself against every such possible distortion. In this respect a scholar's reconstruction of the original author's thought from his intellectual remains petrified in book-form, is very much like that of a naturalist's reconstruction of the body of an extinct animal from some of its remains petrified in rock-form. This branch of a naturalist's work is called palaeontology. So also this branch of a scholar's work may be called Palaeo-Bibliography.

06 Aristocracy of Scholarship

Palaeo-Bibliography is a high-water-mark in the aristocracy of scholarship. The immediate motive which puts a scholar in its pursuit is the joy of knowing what looks like unknowable. Many are the hurdles in the path of pursuit. Very exacting and varying have been the devices made to cross the hurdles.

When the medium of communication was the spoken word, as it was in the communication of the *Vedas* in the ancient days, the skill needed was largely linguistic with emphasis on phonetics. It also required considerable insight into the cultural ethos of the periods not only of the author but also of each of the epochs through which the book had been communicated.

When the medium of communication was the manuscript, the hurdles took a new shape. Calligraphy became the point of emphasis in linguistics. The determination of the date of the manuscript came to engage considerable attention. Collation of all available manuscripts became the bed-rock of reconstruction. I remember the thrill which problems in manuscripts used to induce in my respected friend Mahamahopadhyaya S. Kuppuswami Sastriar, the prince of aristocracy in Sanskrit scholarship. I remember the ecstacy into which he used to go, when he hit upon the right emendation in the last letter of a verse in a manuscript he was reconstructing. His delight was unbounded, when years later, an old manuscript was found containing his emendation.

When the medium of communication became the printed book, there came the fond belief that the original had been once for all fixed and there was no longer any question of reconstructing the original author's draft of the book. But it all turned out to be a false hope. On the other hand, hurdles appeared. There was still need to examine every available copy of an edition of a book in order to reconstruct the ideal copy of this edition. The scholar had still to explain and describe the textual history of the edition and to put it in correct relation to other editions. The reconstruction of the true text of the original of a book is a lure for the aristocracy in scholarship. In his presidential address to the British Bibliographical Society (*Library*, s 4, 11, 1931, 250-1) W. W. Greg says "Books are of importance only as the vehicle by which (their) contents reach us. Books are our main link with the thought and action of the past.. Bibliography is the study of the material translation of literary and other documents ; its ultimate aim is to solve the problem of origin, history and text so far as this can be achieved through minute investigation of all the material means of transmission."

Aristocracy of scholarship has given rise to three species of Palaeo-Bibliography:

1. Descriptive-Bibliography ;
2. Historical-Bibliography ; and
3. Textual-Bibliography.

061 DESCRIPTIVE BIBLIOGRAPHY

Descriptive Bibliography deals with books as material objects formed by the mechanical process of printing. It is not, often, concerned with the text of the book. Even when it does, it does not do so from the critical or literary angle. It merely treats it as paper impressed with certain symbols. It concerns itself only with the mechanical relation of these symbols. Its aim is to give complete facts about the gross body or the physical dress of a text.

0611 Defined Field

A Descriptive Bibliography usually sets forth with a definition of its field. It may confine itself to:

1. a single work [e.g. Steck (J.S.). *Dryden's Indian emperour: The early editions and their relation to the text*]; or
2. a single author (e.g. Johnson (F.R.). *Critical bibliography of the works of Edmund Spenser printed before* 1700. 1933.]; or
3 a single printer (e.g. Hazan (A.T.). *Bibliography of the Strawberry Hill Press.* 1912; or
4 the binding in a single country (e.g. Thomas (H.) *Early Spanish book bindings, XI—XV centuries.* 1939. 46+65; or
5 a single subject and period, (e.g. Greg (W.W.). *Bibliography of the English printed drama to the restoration*; or
6 any other limited field.

0612 The Objective

The objective of Descriptive Bibliography is:

1. Standard description, according to a formula, of a series of books within the defined field;
2. Setting up a description of the Ideal Book in the said field;
3. Listing all kinds of irregularities i.e. deviations from the ideal;

4. Determining the method of production of each form of each volume; and thereby;
5. Clarifying and explaining the differences in the texts of the several copies of each book in the series; and
6. Interpreting features which bear on the method of printing and publication of the entire book or any part of it.

0613 Completeness of Coverage

From the account of the objective it can be seen that Descriptive Bibliography can not reach its ideal unless every existing copy belonging to the defined field is physically examined. The discovery of even a single copy with special features of its own may upset the description set up for the ideal copy prioı to its discovery. This has often happened. Such completeness of coverage will obviously be impossible if any time limit is put on the work. Greg's *Bibliography* mentioned in section 0611 is said to have taken more than twenty years.

0614 Arrangement

No single mode of arrangement can be prescribed for all Descriptive Bibliographies. The arrangement will have to depend upon its defined field. It may have to be on the basis of author, edition, chronology, paper-maker, printer, binder, water-mark, type-face or any other characteristic which is germane and essential to the objective of the bibliography.

0615 Notation

The method of description used in a Descriptive Bibliography is according to certain recognised principles of bibliographical notation. The notation should generally fall within the stream of tradition. The conventions should be respected. Unless this is done a Descriptive Bibliography will not be normally intelligible, precise and concise. To have recourse to non-technical, non-notational description is wrong. It is usually advocated in the interests of the so called general reader who is either a myth or in such minority that his requirements should not be met at the cost of the convenience of the more numerous scholarly readers. A detailed bibliographical description is really a substitute for a personal examination of the book placed at the service of a scholar who cannot have access to the book itself.

0616 Minimum of Details

From the point of view of the minimum of details to be included in Descriptive Bibliography, three periods should be recognised:

1 Fifteenth century ;
2 Sixteenth, seventeenth and eighteenth centuries ; and
3 Nineteenth and twentieth centuries.

The books of the fifteenth century are called incunabula (=cradle books). The literary urge is least incident in the study of incunabula. It can be said that virtually the sole objective in the Descriptive Bibliography of incunabula is only the reconstruction of the history of printing and book-building.

In their case the description must have the fullest details. This field has been explored more or less thoroughly. The results are embodied in the *Catalogue of fifteenth century books in the British Museum* and in the *Gesemtkatolog der Wiegendrucke* which is still in progress. The first volume of the former and the third of the latter contain excellent full descriptions. Standard rules of description for incunabula will be found in Henry Guppy's *Rule for the cataloguing of incunabula*, 1924. As the number of books published in the fifteenth century is relatively small, both complete coverage and fullness of details are possible in a Descriptive Bibliography of the period.

In the second period however the number of books published was far greater. The number of printing presses also was far greater. This makes complete coverage more arduous. Moreover in this period there is a shift of interest from the history of printing to the problem of the text and its relation to the manuscript from which the book was set. All these factors have resulted in reducing the number of details in the descriptive catalogue belonging to this period.

In the third period the numbers involved had grown even to greater dimensions. This by itself has called for further reduction in the details to be given in descriptive bibliography. Another factor, which has influenced it, is the virtual abandonment of printing by hand and the advent of the machinery into the book trade. At the beginning of the nineteenth century laid hand-made paper began to give place to machine-made paper. The former was in definite and small sizes. The latter is produced in extra-large sizes and in rolls. At about the same time machinery for printing also came in. A book can be printed from plates such as stereotype, electrotype or photo-lithography. The power press used may be either flat bed or rotary. About the end of the nineteenth century machinery was invented for type-setting also. Two kinds came in—linotype and monotype. There is difficulty in recognising the precise method by which a book was printed. The materials involved do not present sufficient individuality challenging identification. The relation between compositor and press-man to the copy has been standardised. So also the relation between the author and the publisher is more regular. These factors do not create sufficient problems for solution by methods of Descriptive Bibliography. Further Descriptive Bibliography has to depend upon aristocracy in scholarship. Scholars are always too few for the work in hand. Scholarship by its very nature turns to the past rather than to the present. There is always a casual feeling that the present can be managed without the special training which students of the past must undergo. The craze for first editions is often motivated by cold-blooded commercialism. Scholarship fights shy of anything smelling of commercialism. Moreover scholars prefer to work on a stabilised body of materials. The whereabouts of copies of the books of earlier periods are truly recorded in the printed catalogues of the libraries in which they have settled down. The same facility to locate the required number of copies for examination is not available for a Descriptive Bibliography of modern books. The result of all this is that the Descriptive Bibliography of the books of the third period is not as highly organised as that of the earlier periods. There is more of descriptive cataloguing than of Descriptive Bibliography. Even where Descriptive Bibliography is attempted the details given are comparatively few.

0617 Analytical Bibliography

Since Descriptive Bibliography is based on meticulous analysis of every physical feature of a book it is also called Analytical Bibliography. It may be again repeated that the term Descriptive Bibliography may denote either a book which actually describes a series of related books or the art of composing such a book. This book is not concerned with the Descriptive Bibliography. A full account of its technique and the convention about the notation will be found in F. Bower's *Principles of bibliographical description* (1949).

062 HISTORICAL BIBLIOGRAPHY

If we have several descriptive bibliographies worked out with care, it is possible to collate them and to distil out of them a history of printing and book production. Historical Bibliography is the name applied to the branch of bibliography which is devoted to this subject.

063 TEXTUAL BIBLIOGRAPHY

Another use to which descriptive bibliographies can be put is the determination of the original text as it left the author's hands. This is of vital interest in editorial work. Indeed the reconstruction of the author's text is regarded as the highest aim that a Scholar can set before himself. Some however equate textual criticism of this kind with pedantry. They say that this is the result of the dead hand of a tradition which originated in the reconstruction of manuscripts where calligraphic vagaries were unbounded. Such a criticism fails to recognise that mechanical means of reproducing books is not any less free from human fallibility. In transfer from manuscript to print and from edition to edition there is as much chance for distortion in text as there has been in transfer through a series of manuscripts. Printing involves a whole series of processes often carried out by persons of no literary knowledge and interests. The printer's devil is not the only devil that can distort the text. The compositor, the proof-reader, the forme-maker and the designer of the title-page of the first edition as well as each of the later editions can introduce intentional and/or unintended deviations from the original. The author as well as the editor of any of the editions may contribute his own deviations. Aristocracy in scholarship maintains that the nearer we could get to the first expression of the author, the nearer we could get to his actual meaning. The elimination of the deviations is the province of textual criticism. It can proceed along two lines—literary and textual. To proceed along literary lines, we invoke the aid of higher criticism. We speculate. We ask "Could this author have used these words in this context ?" We put the challenged words against the background of our knowledge of the author, of his other works and of the state of his contemporary society and its knowledge, beliefs and usages. To start off in this way from the very beginning is liable to lead us astray. The risk is less if textual criticism completes its work first and establishes the ideal copy, and higher criticism steps in thereafter. When the ideal copy has been correctly established, higher criticism may apply its own methods to amend doubtful words, sentences and passages and to test authenticity—whether the author to which the work is attributed or the year in which its composition is placed is genuine. The work in the first of these stages has to be based on descriptive bibliography. The result of this work as well as the methodology of this work may be denoted by the term Textual Bibliography. On account of its being tied up with higher criticism, it is also called Critical Bibliography.

0631 Work Done and to be Done

Textual Bibliography is the fruit of Palaeo-Bibliography, even as Descriptive Bibliography is its stem. Considerable work has been done in Textual Bibliography in many western countries during the last hundred years or more. Many are the Bibliographical Societies—more than a dozen—which inspire and co-ordinate work of this nature. Even more are the organs which embody the results of research. India has done much in the field of manuscripts. The colossal work now in progress to establish the text of the *Mahabharata* is at the apex of Sanskrit scholarship in India. But nothing worth mentioning has been done in regard to printed books. Time has, however, come for it. The writings of Tagore and Gandhi call for it. I remember the need I felt to apply its methods to determine the question priority in regard to Raman Effect. There was discrepancy between the page-number of the *Indian journal of physics* cited by some and that which occurred in the complete volume of this periodical. Raman himself told me that pre-prints were paginated differently and sent out to safeguard priority, which was exposed to danger as a result of Reuter's Agency having flashed news about it to foreign countries. If I had not had this help from Raman, it would have needed all the aid of the technique of Textual Bibliography to settle the question.

This book does not deal with the technique of Textual Bibliography.

064 TAXONOMIC BIBLIOGRAPHY

If Historical Bibliography and Textual Bibliography are the fruits and Descriptive Bibliography the stem of Palaeo-Bibliography, there are several roots which feed and support the stem. These roots are concerned with the following categories some of which are described in chapters 6 to 8.

1 Paper-making

- 11 Paper mills
- 12 Water marks
- 13 Paper sizes
- 14 Paper quality

2 Typography

21 Type-casters
22 Punches
23 Matrixes
24 Type families
25 Type sizes
26 Type founts

3 Composition

31 Number of columns
32 Compositor's measure
33 Justification
34 Side notes
35 Box rules
36 Number of lines
37 Leading
38 Punctuation

4 Imposition

41 Type-page
42 Opening within the furniture of chase and margin
43 Number of lines in a page
44 Headline including running title and pagination or foliation
45 Direction line including catchword and signature

5 Preliminary Pages

51 Half-title page
52 Title-page
521 Borders, compartments and frames
522 Rules
523 Devices
524 Cuts
525 Ornaments
526 Mottoes
527 Imprint
528 Interpolated notes
53 Dedication
54 Contents

6 Extra-Textual

61 Tables
62 Appendices
63 Index

7 Colophon

71 Printer
72 Scribe
73 Title
74 Author

8 Title

81 Of the text
82 Of the sections

91 Assemblage

911 Format
912 Collation and gatherings
913 Insertions
9131 Outside the gatherings
9132 Inside the gatherings
914 Cancels
92 Illustrations
93 Binding

Considerable work has already been done on most of these categories. Standard dictionaries exist. Dated descriptions are found in them. Each of these may be called a Taxonomic Bibliography. These are results of extensive research of an empirical kind. All the three branches of palaeo-bibliography are now rooted on the approved standards regarding most of the categories enumerated above.

This book does not deal with any of these auxiliaries of palaeo-bibliography.

07 Democracy in Education

In section 06 and its sub-divisions we saw the ramifications of physical bibliography in the sphere of aristocracy in scholarship. Those who tend them have been drawn mostly from scholars themselves and a few from custodians of collections of books belonging to the first three or four centuries of the Gutenberg era. These ramifications are turned into the past. That is why we called the resulting branches of bibliography by the generic name palaeobibliography. We shall next turn to the ramifications turned into the future. These are in the sphere of Democracy in Education.

Democracy has been asserting itself in recent years. It asks for equal opportunity for one and all. The emphasis has naturally to be on those who had been denied opportunity in the past. The result is that democracy is also taken to mean the under-privileged masses as against the privileged classes. The backing of the democracy in the second sense by democracy in the first sense is visible in all spheres of life today. Democracy is asserting itself in regard to political rights, standard of life, distribution of wealth, dispensation of justice and every other factor emerging from the living of man in organised society. Education is no exception to this. Democracy in education is one of the outstanding social happenings of the last hundred years. Schools were the first social institutions thrown forth to answer its call. Library as a social institution is being transformed at the call of democracy. Its emphasis is extending from service to severe scholars, to service to the democracy. The outlook of library authorities is being changed. The resistance of the old guards in the library profession to the pressure of democracy is melting away. The new generation of librarians are beginning to adapt themselves to the call of democracy in education. They realise that service to the common man—be it for information or recreation or inspiration—is as important as service to the severe scholar. Library organisation itself is, in an informal way, introducing division of functions and labour. It is charging a few libraries in each country to specialise in the old aristocratic function of giving service to scholars. At the same time, it is also promoting a nation-wide net work of libraries to discharge the new democratic function. This change-over in the outlook of library authorities, in the attitude of the library profession, and in the set up of library organisation, had taken nearly a century in the countries which began to develop earlier.

071 SOCIAL BIBLIOGRAPHY

Time has come to develop the topics enumerated in section 03 from a new angle. Treating them as topics in palaeo-bibliography should no doubt be continued to be consigned to the care of " a few scholars and scholarly librarians " working in or caring for the few necessary antiquarian libraries. This is necessary but not sufficient. Treating them as topics in technology and useful arts should be continued by technologists and business organisers. This is necessary but not sufficient. The new approach to the topics in physical bibliography should not be as for the paper-manufacturer, type-caster, printer, binder or publisher—as for the book trade in short. Nor should it be as for analytical, or descriptive, or historical or critical or textual bibliography—*i.e.* as for the scholars turned on the study of the books of the past as a foundation and a means to capture the details of the culture of the past. The new approach should be towards the book of the future. It should follow the path of making books an effective tool in self-education and self-entertainment as much for the democracy as for the aristocracy (in the intellectual sense). It should examine the ways and means of making books readily acceptable to the common man and even capable of luring him into their use. It should explore also the ways and means of making books conserve the time and energy of the intellectuals in picking up communication from one another. The study of physical bibliography from this angle—the angle of the future, the angle of the democracy, the angle of the team-work of thinkers working-in-series, in short the angle of the library as a social institution charged with serving books for self-education and self-entertainment for the masses as well as the classes and for conservation of social energy in the pursuit of knowledge—such a study of physical bibliography may be called Social Bibliography.

072 LIBRARIAN'S ROLE

Social Bibliography is physical bibliography for librarians whose role in social economy is to implement the demands of the Five Laws of Library Science. The book as a physical produce is but the container for abstract thought. What is contained in it does not easily arrest the attention of the consumers. It does not entice them. For the hunger for thought is feeble and fleeting. It is not compelling. The librarian would therefore be helped if the container is inviting and comfortable to handle. In the individual reader who feels that certain improvements in the physique of books will make them more acceptable and add to his comfort, the feeling is fleeting. One man's feeling is too feeble to reach the producer's notice and to produce an effect on him.

Therefore, the library profession—particularly those on the profession that do reference service—who are the ultimate distributors of the produce, have a special responsibility in the matter. They see the momentary feelings of each reader whether they are expressed verbally or not. They see it continuously when they are on floor-duty. They can integrate all these feeble feelings into one with considerable intension. Though even then an individual librarian can not effectively carry it to the book-trade and influence it, he can pass it on to his own professional body. The professional body can digest the reports of its individual members and press its findings effectively on the book-trade.

073 EMPIRICAL STUDY

The resulting digest will perhaps lay bare points which require further observation and perhaps even experimentation. In that case the profession can formulate specific problems for investigation by individual libraries. Field study can be conducted in libraries. The readers can be observed unobtrusively to know the comparative efficiency and appeal of:

1. the jacket, the binding, the size, the shape, the weight and other physical qualities of the book ;
2. the qualities of the paper, the type-face, the illustrations and the lay-out of the page, and its total colour-effect ; and
3. the adequacy, the order and the design of the parts of the book like contents, preface and index or in other words the layout of the book as a whole ;
4. the balancing of the letter press with graphic aids like maps, pictures, histograms and schematic diagrams ; and
5. alternative physical forms for reading materials, designed for reasons of economy or of requirements of special classes of people or even of presumed greater effectiveness to meet the requirements of normal users.

Pure observation without manipulation of any sort can be reinforced by manipulation of the factors concerned and observations under control—by experimentation, in short. In other words, the library can be used both as an observatory and as a laboratory. The library profession can thus make an empirical study of problems in Social Bibliography and pass it on to the producers in the book-trade.

The book-trade can with advantage be brought in even at the stage of the design of experiments. Psychologists and other specialists too may have to be brought in for specific technical aid. This is a possible line of work in Social Bibliography in which it is only the library profession that can play the primary role.

074 SELECTIVE ASPECTS

What the technicians in the book-trade can learn from the empirical study conducted under the auspices of libraries will cover only a few selective aspects of the crafts forming the book-trade. For the readers are not the only consumers of their produce. Paper is not used for printing alone ; it is used in several other ways—for packing, toilet, decoration of walls and furniture and in diverse other ways. Printing is not used for producing books and periodicals alone ; it is also used for producing posters, forms and registers and for diverse other purposes. Binding is not used merely for books in public use in libraries ; it may be used for some for sheer aesthetic purposes. Thus, the book-trade's interests are diversified. Therefore, the selective aspects of Physical Bibliography, which affect readers and thereby the library profession, should be taken charge of by librarians and pressed on the attention of the book-trade.

075 INDIA'S OPPORTUNITY

Empirical study of Social Bibliography is necessary. It has not yet been done on an adequate scale by the profession. It has not yet been planned and pursued in a comprehensive manner, nor in an objective manner in conformity to the principles of scientific method. No doubt investigations have been made on paper, printing and binding as will be seen in Chapters 6, 7 and 8. But these are largely from the angle of strength, durability and preservation. But concerted and continuous work from the angle of Social Bibliography still awaits to be started. The delay in its being started is traceable to the delay in recognising the educational and other social functions of libraries. The delay in their recognition is traceable in its turn to the delay in the emergence of the ideas of democracy—in the sense of equal opportunity for education, particularly self-education, and for self-entertainment for all. Democracy in education and intellectual entertainment has been emerging in slow stages in the Western countries during the last century. When there is a slow emergence, thinking and re-adjustment can be done slowly, casually and without plan. They can be left to flair and intuition. They need not necessarily be based on deliberate experiment and observation. They can be left to the effort of isolated individuals who are more sensitive than others to the new situation which is emerging. They need not necessarily be done as a public project, under the auspices of a learned body or at the level of the Government. This is what has happened in the countries which began to develop a century or two ago. But it can not be so in a country which had been resting for centuries and wakes up late in the day. Under the pressure of what has happened elsewhere, the emergence of democracy in such a country is explosive and precipitous. What was achieved in countries of " slow " emergence in the course of a century has to be achieved within a single generation or perhaps even within a decade in countries of " sudden, explosive and global " emergence. India and most of the Asian countries are experiencing sudden and global burst into democracy. Equal opportunity for self-education and intellectual self-entertainment has to be provided all at once to hundreds of millions of people with the widest imaginable scatter of self-educability and capacity for self-entertainment through books and kindred reading materials. Consequently, India's opportunity to pursue Social Bibliography empirically, according to scientific methods, backed by observation and experiment and to pursue it as a public project is unique. Will India—its library profession and its Ministers of Education and Natural Sciences—rise to the occasion, grasp the opportunity, and do its duty to its present phase of renascence ?

076 SOCIAL EDUCATION LITERATURE

India must do so. It has a unique opportunity to do it on a large scale. It lends itself to become a huge laboratory and observatory for investigation in Social Bibliography. For independent renascent India has inherited 85 % illiteracy. Although it has managed polling without literacy, it cannot use its independence effectively without liquidating the appalling illiteracy which prevails. It may be that the present talk of " liquidating illiteracy " among the adults within a few years proves to be vain ; perhaps it will. But it must be possible to start compulsory education immediately. If this is done and if the new generation is raised as a literate generation, within twenty-five years, illiteracy will be liquidated by sheer efflux of time—the old illiterates disappearing and the new generation rising fully literate. In this transitory period, at least some illiterate adults are sure to become literates. There will thus be need for producing books suited to neo-literates. When literacy becomes universal, there will be need to produce books suited to the lower quartiles (in the intellectual sense). Books for the neo-literates and for the lower quartiles go by the name of Social Education Literature. India has now to face the problem of social education literature. This problem has indeed caused a crisis in India's book production. The novelty of the crisis dazes people. It blinds. It paralyses. It is making people insensitive to its implications. It is not known how to set about to meet the problem. There is considerable confusion in thinking. The questions of discovering authors of the right sort, finding illustrators who can work with the authors on the one hand, and the problems of physical production of the books so as to appeal to the neo-literates and the lower quartiles on the other, are not separated. They ought to be separated. Their solution will have to proceed along different lines. They will have to be tackled by different techniques. If they are, India will create for itself the opportunity to pursue Social Bibliography empirically, according to scientific methods backed by observation and experiment. It is only if that opportunity is created and seized that the problem of social education in the colossal scale, which it has assumed in India, can be tackled with success.

077 SCIENTIFIC METHOD

The procedure of experiment and observation is only one of two possible procedures in the scientific pursuit of any problem. Scientific method discloses an everlasting cycle incident in the pursuit of any subject. The cycle moves amidst :

1 Observed facts ;
2 emprical laws cooked out of a vast set of observed facts ;
3 a hypothesis sublimated by intuition from a vast set of empirical laws, or normative principles pressed out of intuition by teleological forces ;
4 deduced laws derived by sound logical syntax from hypothesis or normative principles ;
5 looking into the world of facts for confirmation of deduced laws or for their denial ;
6 reconciling the deduced laws and the observed facts in case of non-conformity, by elimination of any possible flaw in the logical syntax on the one side and the observational and experimental technique on the other ;
7 building up new data in case a crisis is

created by the unbridgeable gulf between deduced laws and observed facts ;

8 formulating new empirical laws from the new observed facts ; and

9 the repetition of the cycle in this manner *ad infinitum.*

078 A PRIORI STUDY

In this infinite process, there can be neither a beginning nor an end. We have to begin our pursuit anywhere and at any stage. Empirical study of the problems is not the only starting point available in Social Bibliography. We can also start with *a priori* study based on some assumed normative principles. In the empirical study we start with sensing facts and provoke intellectually generalised empirical laws and intuitively set up hypothesis and fundamental principles. In *a priori* study we start with intuitively enunciated hypothesis or fundamental principles and provoke intellectually deduced laws and stimulate exploring for new facts by observation and experiment. The library profession has some normative principles which serve as its spring board. It is therefore possible for it to start with an *a priori* study of Social Bibliography. This book is confined only to such a study. It will be found in chapters 1 to 5.

08 Laws of Library Science

Every problem in Library Science stems from Five Laws. Social Bibliography is no exception to this. These Five Laws are the normative principles behind all library practice. These are briefly discussed in my *Library manual* (Indian Library Association, English series, 3), 1951 and were first stated and elaborately studied in my *Five laws of library science* (Madras Library Association, publication series, 2), 1931. These principles contain every possible problem in a potential or unexpressed or invisible form. They hold it in secret. This secretive habit is a characteristic of the fundamental principles or hypotehses of every science. These principles often appear quite trivial. The greater the triviality, the greater is our wonder that they could secrete so much within themselves. The pursuit of any science involves the extortion from its fundamental principles all that they hold in secrecy. The history of a science is, in a sense, the history of this extortion. It looks as if we can never see the end of it. This is the same as saying that the implications of the fundamental laws are infinite. No student of a science need to fear that his subject will be exhausted at any time. If at any time the field of a science appears to be nearly exhausted, the true inference should be that the fundamental principles with the aid of which the field is exploited are not truly fundamental. With this in mind, let us examine what the Laws of Library Science hold in secret about Social Bibliography.

CHAPTER I

FIRST LAW AND THE MYSTERY MATERIAL

Let us first coax the First Law—Books are for use—to give out its secrets in this matter. If there is a gang of persons to be tackled, a clever policeman deals with each separately. That is the way to success. In the First Law there are two connecting words " are " and " for " which seem to be innocuous and incapable of keeping any secret. The two substantive words which need close examination are " Books " and " Use ".

11 Books

In Section 020 of chapter 0, we have already seen the disclosure of the word " Books ". It disclosed that a ' Book ' is a trinity consisting of (1) thought, (2) linguistic and graphic vehicle for the thought, and (3) the print and the pictures, the materials on which they are impressed, and the coat in which the printed material is encased. We saw in section 03 which of these fall within the purview of physical bibliography of which Social Bibliography is a division.

12 Use

Let us next ask the word " Use ", about the constituents of " Book ", which it has in mind. Its immediate answer is " Thought-content ". If we threaten asking whether we may then burn away the physical constituent of the " book ", " use " will begin to plead that it was too hasty and thoughtless and that the physical constituent is a necessary means in the communication of the thought to be put to use. However, it will warn us that this use is only the indirect one of serving as a physical vehicle for thought and not a direct one like using it as a pillow, or as sunshade, or even as part of pretty furniture. This restriction on " use " has to be recorded because there are people who put a book to such direct uses. I remember an old teacher of mine whose head used to rest on a pile of three stout volumes bound in canvas, during his mid-day siesta on a bench of the class-room. It is not uncommon to find people spreading a book between their head and the sun ; the use of it even against drizzle is not altogether unknown. I have heard of a rich but illiterate land-lord of the South fitting up a drawing room to receive the Governor of the Province. He had heard of Vatsyayana's specification for the drawing room of a nobleman given in his *Kamasutra* :—

> "A lute hanging from an elephant tusk, a drawing board, a pot of perfumes, some book and some garlands of the yellow amaranth flowers."

He therefore got some handsome rose-wood book-cases and fitted them with books cased in glittering ornamental binding. Persia contributes a similar anecdote. The scene was in a Persian book-market of the twelfth century. A beautiful-looking book was being auctioned. There were only two bidders—one a famished person in rags and the other a fat noble-man in rich robes. After the bid had been taken up to a certain level, the man in rags told the one in robes, " I am too poor to outbid you.

This is a rare book. I long to peruse it. By all means knock it down yourself. But will you kindly allow me to glance through it once ? ". " Certainly, my dear man, " came the reply, with all the air of patronage, " I shall make a present of it to you next week. " " Why then did you bid for it? " enquired the scholar. "The king is visiting my palace this week ", the courtier said. " To suit the occasion, I fitted up my drawing room with fine book-cases and filled them with nice books. There is just one gap which this book will fittingly fill and fillingly fit. After the visit of the king, I have no use for this book. " The First Law is concerned only with the direct use of the intangible thought contained in the book and the indirect use of its physique as the tangible and portable container of the thought.

120 CONFLICT OF QUALITIES

The First Law has had great difficulty in effecting a compromise between the two qualities of the physique of the book—durability and easy-to-handle quality. In ancient days the physical basis of books had to be drawn from materials occurring in nature. As the writing of a book meant a long and costly process and there was no mechanical method of reproduction, a single copy had often to be shared by many. This was not merely among contemporary people. The copy had to be passed on to successive generations too. These two factors led to greater emphasis on the durability idea than the easy-to-handle idea. In fact it is the anti-First Law that decided the issue. It was the urge to preserve, rather than to promote use, that predominated and chose the physical base of a book.

121 DURABILITY

It is believed that the urge of durability had sought the stone as the first material upon which letters were chiselled and through which thought was communicated to contemporaries as well as succeeding generations. The stone walls, steps and pillars in the temples of India are often documents and books. The Department of Epigraphy is engaged in conserving the originals of these books in stones and making photographic and other mechanically reproduced copies available for distribution among scholars. These form the bed-rock of historical research. The Rossetta Stone with its trilingual inscription, found in 1799 near a mouth of the Nile, is a famous example of a stone-book having proved an extraordinary means of communication between the ancients and the moderns. Metal plates—brass, copper, bronze etc.—had also formed the physical media for communication of thought. We have many books in copper plates preserved in the museums. The urge for ease of writing was probably responsible for the brick-books of the Chaldeans. They engraved their writing in soft clay made in the form of bricks. These were then baked or sun-dried in the usual way. Specimens of Assyrian and Babylonian tablets are found in museums. Existence of libraries of thousands of brick-books in the distant past is mentioned by historians. Books in wooden tablets too had been in vogue in Greece as well as India. Aurel Stein had discovered many such books in wood in the deserts of Turkistan.

122 EASY-TO-HANDLE

Books written on such materials are difficult to handle and even impossible in some cases. The First Law had to wait for the discovery of a material which will lend itself to be written upon and at the same time the resulting book will be easy to handle. What are the factors that can make or mar ease in handling a book as a physical entity? What are the physical qualities of a book that will recommend its acceptance ? The same qualities, more or less, that play a prominent part in the selection of many things in life. Suppose we have to select a house. What are the physical qualities that will determine its acceptance ? Surely we should like the house to have a convenient lay-out or shape. A house of twenty rooms for a family of four members will be a burden rather than a help. Surely no wise man will select that house ; nor can one select a single-room house for that family. Comfort in size is something which is definite and which is uniquely determined in each context. Or again take the case of determining physical qualities which normally weigh in the selection of personnel. We would reject a Brobdingnagian at one end and a Lilliputian at the other. The optimum size for a human body goes perhaps with a height lying between 5½ and 6 feet and the other demensions in graceful proportion. Again we would all prefer a straight body to a hunch-back. Let us pursue the physical qualities of a book in a similar way. From the point of easy-to-handle idea, surely three well-known qualities of any physical body are: (1) Weight, (2) Shape, (3) Size and (4) Stiffness cum Foldability. Let us examine what exactly is the message of the First Law of Library Science in regard to these physical qualities of a book.

123 WEIGHT

The weight of the materials mentioned in Section 121 went against them. Men were always on the look-out for lighter materials. A few convenient ones were found very early.

1231 LEAF

Perhaps the earliest light materials used were leaves of trees. The leaf of the palmyra tree came to be used very early in South India. The feathers of this leaf have a smooth surface. These feathers were cut into convenient sizes. The width used to be between 2 and 4 inches and the length between 10 and 20 inches. After being cured, it was fairly stiff for handling. Letters were cut into the leaf with a sharp iron stylus. These cuts were filled with a black or green pigment mixed with oil. This made the characters show distinctly. Being pure cellulose it preserved very well. Each leaf was pierced with two holes and a gathering of leaves was strung together with cards passing through these holes. The resulting gathering was protected by wooden boards on both sides. Some of the most ancient classics of South India and Ceylon are still preserved in such palm leaf books. Even today it is the palm leaf book that is used in initiating a child in the art of writing and reading. I was myself initiated in that way in 1897. I preserved my first book in palm leaf for a long time. Merchants kept their accounts in palm leaf books till recently. When the fishermen of Calicut presented an address to me in 1945, they chose the palm leaf as the material medium. Instead of engraving with a style, the address was printed in gold colour on the palm leaves. The Government Manuscripts Library at Madras is very rich in palm leaf books. So are the oriental libraries at Mysore and Trivandrum. In Assam leaves of the aloe were used as writing materials. Pliny has recorded that the Egyptians too wrote on palm leaves. It is said that sentences of banishment were termed " petalism " from the Greek word meaning " leaf " as Greek sentences were written on the leaves of the olive tree.

Perhaps the use of the word " leaf " to denote a page in a modern book is traceabe to this use of leaves of trees for writing books on in the far off days.

1232 Bark

In North India books were written in ancient times on the inner bark of the birch tree (=Bhurja) which grows abundantly in the Himalayas. This bark was cut into strips of between 3″ to 9″ width and 20″ to 40″ length. The strips were coated with oil and polished. These bark-books are found in Buddhist stupas. There are many such books in libraries of Indian manuscripts. The writing on this bark was also by a stylus. This bark is not, however, as pure cellulose as the leaf of the palmyra. It therefore cracked and peeled when dried and attracted fungus when damped. The red Indians and the other old races of America used to write on the bark of the white birch tree with sticks and some liquid pigment. The ancient Romans too used the inner bark of certain trees as writing material. The bark was known as " liber ".

The modern term " Library " is traceable to the use of the bark (=liber) in building books.

1233 Papyrus

The materials used in ancient Egypt for writing books was papyrus. It was cut from the stem of a plant growing in the Nile and the other rivers. The stem was cut into pieces of about 2 feet long and split down the centre. Strips were cut into thin sections. Two such sections were laminated with their grains, running at right angles. Thus the preparation of papyrus meant a little more of craft than that of palmyra leaf or bhurja bark. The sheet was polished. It was fairly strong and pleasant to the eye. It was written upon with a pigment. Pieces of papyrus were pasted together in one long strip and rolled into a volume.

The word " paper " is traceable to the word " papyrus ". The words " Bible " and " biblia " are traceable to the Greek word " bubloy " which denoted the inner fibre of the papyrus plant. The word " volume " is traceable to the Latin word " volumen " which denoted a roll as the papyrus book was.

1234 Amatl

If preparation of papyrus requires a little more manipulation than that of palm leaf, we find a further degree of manipulation in the writing materials used by the Mayas and Aztecs of America. The paper made by the latter is called "Amatl". It was made from the inner bark of a tree belonging to the same family as mulberry. The bark is about an inch or more in width. After removing the outer bark the fibrous inner bark is boiled over a slow fire. This process disintegrates the fibre to some extent. The disintegrated fibres are laid side by side on a rectangular board. Several strips are put on the same board each strip slightly overlapping the next. The strips are then beaten until they are united into a sheet. The beating has to be done for several hours spread over more than one day. The Mayas and Aztecs wrote their books on surfaces made in this way. Books were formed with several such strips. The book was folded like a screen to form distinct pages. Such books may be as much as a foot high when folded and 15 or 20 feet long when spread out. It is said that the Mayas had extensive libraries of such books.

1235 Textile

In ancient China woven fabric was used as writing material. It was the invention of camel hair brush in the third century B.C. that adapted cloth as writing material. Books and scrolls were made of woven cloth. But cloth was too costly to be spared for this purpose. Nor did it have the necessary stiffness. It was not therefore widely used. Cloth considered as a written material required more fabrication than any of the materials described in the earlier sections.

1236 Skin

Skin of animals is another material used to make books. The flesh side of the split skin of sheep is parchment. Skin of calf is vellum. It is not split as in the case of parchment. The use of these materials began about two thousand years ago. The " utirine ", the delicate vellum used for illuminated manuscript is so called because it is believed to have been the skin of unborn calf. Vellum or parchment is not leather as it is not tanned. They are prepared with lime. It is this which gives it the nice surface. Parchment continued to be in use even after the invention of printing. It is said that the skins of 300 sheep were used to produce one copy of the Gutenberg *Bible*. Although parchment is still used for writing documents and diplomas on account of its durability, it ceased to be used for printing from about 1500.

1237274

The term " parchment paper " is traceable to the use of parchment in the earlier days as the material for writing books.

M102
J2

1237 Optimum Weight

None of the above mentioned materials gives full satisfaction to the First Law in regard to weight. A book built out of these materials will be too heavy to handle if the number of words is about 100,000. The First Law would like to have some material such that books of 100,000 to 300,000 words weigh only between 1 lb. and 3 lbs. Humanity had been in search of such a material. It has discovered it and we shall describe it in section 13 and in the later ones.

124 SHAPE

Next to weight, the shape also determines how easy-to-handle a book is. The shape of a book is determined by the shape of each of its leaves. Of course it is necessary that all the leaves should be of the same shape. It may also be desirable to have some freedom of choice among alternative shapes. Stone, metal and skin give little freedom of choice in regard to shape. Alteration of shape is laborious in their case.

1241 Leaf and Bark Book

Palm leaf is a natural material. It is born with its own shape. Manipulation cannot modify it to any great extent. As we have seen in section 1231, each leaf is a narrow rectangle. A pile of such leaves with such a rectangle as the cross section is not a shape which is easy-to-handle. Such a palm leaf book cannot be made to stand on its smaller cross section. It has to be made to rest on its longer rectangular cross section. The result is that the shelf-space required to house palm leaf books is inordinately great and expensive. All these remarks apply also to birch bark books.

1242 Papyrus

Books of papyrus also presented a similar rigidity in regard to shape, as papyrus cannot deviate to any considerable extent from the natural dimensions which the basic material has in nature.

1243 Amatl

The writing material Amatl made by beating several strips of fibrous bark into a continuous sheet is even worse in regard to shape. We saw in section 1234 that it had a longish narrow shape when folded, and that it became a single sheet several feet in length when spread out. A book of such a shape is difficult to handle.

1244 Textile

Cloth has no stiffness. Each leaf of a cloth-book folds and crumples. It is not able to keep its shape. Though it is possible to have cloth of any basic shape, on account of its lack of rigidity a book of cloth is not suitable for handling.

1245 Roll

With papyrus as well as with vellum as the basic material, a book was made in the distant past by pasting all the leaves together in one long strip. At both ends it was pasted to a wooden handle. The whole was kept rolled up on the handles. I saw in the Public Library of Philadelphia a whole Indian book in the form of a roll. Its title was *Janmapattrika or horoscope of Rajah Jadunatha Simha, one of the Tippoo Sahib's Officers at Lucknow.* The size of it was 120 ft. × 10½". A book of that form was called a roll. This word is still preserved in the designation of an important officer of Her Majesty the Queen of the British Isles—Keeper of the Rolls. It is also preserved in the name of a learned body called Pipe Roll Society of the same country. It is naturally difficult to refer to a book in such a roll-form. Though we still keep maps in the form of rolls, the First Law long ago ruled out rolls as a form for books.

1246 Codex

The modern form of the book was originally called " Codex ". It was so called because of the blocks of wood which were used as their protecting covers. " Codex " means block of wood.

The term " Codices " as applied to law digests is traceable to these blocks of wood.

1247 Optimum Shape

After centuries of trial, it is now felt that a cuboidal shape is the most easy-to-handle and also the most pleasing to work with. It is the height and the width of the book which are more dominant than its thickness in determining the helpfulness of its shape. The shape of a book is therefore normally determined by the ratio of its height to its width. This is the same as the ratio of the length to the breadth of each of its leaves. This ratio is called the Aspect Ratio. The following table gives the Aspect Ratio of commonly occurring octavo books:

Conventional Name	*Height of the Book*	*Width of the Book*
Demy	14	10
Crown	15	10
Foolscap	16	10
Royal	16	10

From the above we can say that the optimum shape is that whose Aspect Ratio lies between 1.4

and 1.6. Taking all the three dimensions, a very pleasing shape is that in which

Thickness : Width : Height
= 2 : 10 : 15

A crown octavo book of 1" thickness has this shape. If we use natural materials like leaves or barks or skins, we cannot secure this optimum value for Aspect Ratio without either reducing the size to beyond what is easy-to-handle or without wastage of material. In the case of woven fabric, any Aspect Ratio can be had. In the case of papyrus too we can secure the desired Aspect Ratio by adjusting the number of strips pasted one to another. But the First Law would like to have some material which can be had as a single smooth, foldable but uncrumpling sheet with any desired Aspect Ratio. Nature does not provide such a material. Man has to make it. He has made it. We shall describe it in section 13 and in the later ones.

1248 Invariant Aspect Ratio

While any ratio within the range 1.4 to 1.6 is easy-to-handle, in recent years when simplification, standardisation and reduction in the number of standards are rightly attempted to satisfy the Law of Parsimony, a search has been naturally made for an Aspect Ratio which will be invariant whatever be the number of times a sheet of the writing material is folded to arrive at the ultimate leaf and page to be written or printed upon. Such an inveriant Aspect Ratio exists. It is a natural ratio determined by the Pythagorean Theorem in geometry. Algebra too helps us to find this invariant Aspect Ratio.

Let x be the Aspect Ratio of the unfolded sheet. This is secured by taking its width to be one unit and its length to be x units. If we fold it along a line which is parallel to and exactly midway between the two shorter edges, the length of the resulting sheet is one unit and its width becomes $x/2$ units. The Aspect Ratio of this folded sheet also should be x. Putting this in symbols we get :

$$x = \frac{1}{x/2}$$

$$\text{i.e. } x^2 = 2$$

$$\text{i.e. } x = \sqrt{2}$$

Whatever be the area of the basic sheet, if after any number of times of folding it should leave its shape unchanged, its shape is what corresponds to the Aspect Ratio of $\sqrt{2}$, or approximately 1.4. We find that books on " demy " sheets have this shape. This invariant Aspect Ratio was advocated by Alfred Watkins of Hereford. The International Standards Organisation has also given weight to the adoption of $\sqrt{2}$ as the Aspect Ratio for books. There are however resistances both from vested interest and from theoraticians who argue that such a theoretical uniformity in shape will deprive one of the power to vary the shape of page according to the particular matter which it has desired to set forth. My own view is that the latter objection is not a serious one and that a single Aspect Ratio need not necessarily restrict the freedom which may be really needed.

125 SIZE

In addition to prescribing the range for optimum weight and shape, the First Law would also ask for certain limits within which the size of a book should be in order to make it easy-to-handle. It goes without saying that convenience of use requires that all the leaves of a book should be of the same size. We have seen in section 1247 that the cuboidal shape with an Aspect Ratio lying between 1.4 and 1.6 is the the most suitable. The determination of the size of a book is therefore reduced to determining its height and its thickness. A miniature book 1″ in height will not certainly be accepted by the First Law. But such books do exist. There are many such miniature editions of the *Koran* and the *Gita*. At the other extreme I remember seeing a giant book in the Royal Library of Stockholm, Sweden. Its pages which were of donkey's skin measured 30″×15″. There are even bigger giants. In 1859 just one issue of a newspaper was produced measuring 100″×70″.

1251 Anti-First-Law-Tradition

In ancient days when books were costly to produce, it was the preservation of a book than its use that was the primary motive. It is easier to preserve a heavy giant folio than to preserve a light handy book. Readers were often obliged to look up books at the place where they were housed. The books were even chained so that they could not be removed beyond the length of the chain. One had to carry his desk to the book shelf and place the chained book on it to consult it. In these conditions there was no urge to give the book a size which would make it easy-to-handle. The result is that many of the books of the earlier centuries preserved in some of the libraries of the West are what appear to be supernormal in size when judged by present-day standard. A size of 3″ × 8½ × 13½″ was very common.

1252 Natural Materials

The natural materials which can be used as writing surface with a slight treatment but without any elaborate fabrication allowed only a very limited range in size. We have seen that in section 123 and its subdivisions. If we impose on them the First Law's requirement regarding shape, the range of size available is still more limited. Vellum did provide leaves of proper size. But it turned out to be very costly. We have already stated in section 1236 that the skins of 300 sheep had to be used to produce one copy of a book. Papyrus was not so costly and it did make optimum size possible in regard to height and width but the thickness became rather more than what is easy-to-handle for a book of 100,000 words.

1253 Optimum Size

The following table gives the book sizes which have now become popular :

Conventional Name	*Size of Octavo* in sq. inches	*Size of Quarto* in sq. inches
Demy	8¾×5⅝	11¼×8¾
Crown	7½×5	10×7½
Foolscap	6¾×4¼	8½×6¾
Royal	10×6¼	12½×10

It is thus seen that the range for optimum height of a book is from 6¾″ to 12½″. The range for optimum thickness is from ½″ to 1½″. The First Law has been pleading that books with between 100,000 to 300,000 words should have sizes lying within the above mentioned range and with weights between 1 lb. and 3 lbs. The easy-to-handle test of the First Law demands that books should conform to the above specification. None of the natural materials fit for writing upon satisfies this test. Man has to fabricate a material that will answer this demand of the First Law. He has done so. We shall describe it in section 13 and in the later ones.

126 FOLDABILITY AND STIFFNESS

There are certain other qualities which the material basis of a book should have. One of them, smoothness, had been incidentally mentioned already. It should not make the colouring material with which the writing is done to spread out. It should be durable. That means its strength should not change with time by the effects of the atmosphere. This in its turn means that the basic substance should be chemically inert. Again either it should have a pleasant appearance by itself or it must admit of being properly tinted or decolourised to produce the necessary pleasantness of appearance. It must be capable of being folded. That is, it must be yielding. At the same time it should not give itself away ; it should not tear or break. There should be a good compromise between toughness and softness. It should be supple but not brittle. Nature does not produce any ready-made material with all the qualities enumerated in this section and the preceding ones. We have to take suitable primary materials produced by nature and fabricate the same in such a way that all these qualities get impregnated into the fabric.

13 The Wonder Material

Paper is the wonder material invented by man, that comes nearest to what the First Law wants. The dictionary defines " paper " as a web composed of vegetable fibres, roughly oriented and matted together to form sheets. This is an over-simplification for paper to be used for books. We should add that the sheet should be treated with size and calendared to fill the pores and make the web present a smooth surface and prevent the ink from spreading. The core of paper is cellulose.

131 CHEMISTRY

Cellulose is a carbo-hydrate with the empirical formula $(C_6H_{10}O_5)_n$. When burnt, it gives carbon. It is tasteless, odourless and white. It is quite insoluble in water. It very nearly resists oxidization. It is also extremely resistant to alkalis. It is the basis not only of paper but of many other industrial products. Apparently it is nothing more than six atoms of carbon associated with five molecules of water. Yet treated with nitric acid it leads us to guncotton. Addition of camphor to guncotton gives us celluloid. Again treating celluloid with mineral acid gives glucose. Dissolving nitrated cellulose in alkali and ether and squirted through fine holes produces threads of artificial silk. But in paper cellulose remains as cellulose. It does not get chemically transformed. It is this which makes paper durable.

132 PHYSICS

The physics of cellulose is best brought out by cotton fibre which contains 90% cellulose, 7% moisture and only 3% of non-cellulose matter. Seen through a microscope it looks like a twisted, fattened, hollow tube with thin outside wall. Hollow spaces remain when these fibres are matted together. It is this physical structure which gives to paper the characteristic bulky appearance and low density. The First Law's requirement about weight is thereby satisfied.

133 BIO-CHEMISTRY

Physiologically cellulose is the main product of vegetable life. The walls of vegetable cells are built of cellulose. These cells are generally longish ones. When the cells are emptied of protein and the other bio-chemical contents, they look like flattened tubes. It is to this form that we owe its felting properties. These cells form the frame of woody structure. The cells are cemented together with a complex of bio-chemical substances which is lignin in some cases and pectin in others. The cells are made water-proof by another substance called resin.

134 ILLS

Cellulose is prone to bacterial attacks. These micro-organisms destroy it. Pulp, which is the name given to the soft formless moist cellulose, ferments if kept for some time. As paper is a carbohydrate it is liable to become a diet of insects.

135 DANGERS

Cellulose yields to the action of inorganic acids and to some extent to organic acids also. If brought in contact with these, the cellulose deteriorates and becomes unfit for paper making. The cellulose found in grass, straw, jute, wood etc. are not sufficiently resistant to strong alkalis and bleaching powder. Therefore paper made from such materials is weaker than the paper made from cotton, linen, linseed and sun-hemp.

136 PULP

To be fit to be used as the basis of paper for writing or printing, cellulose must be separated from lignin pectin, resin and other non-cellulose incrustations which will oxidise and make paper brown and brittle and perish if allowed to remain. These adherents are attacked by chlorine, bleaching powder and potassium permanganate. Cellulose is not. This fact is used to separate cellulose from the unwanted adherents. The process of separation consists roughly of the following seven stages, as set forth in K.K. Joshi's *Paper-making*, edn 4, 1944, p. 19.

1 Fibre = cellulose + non-cellulose matter.

2 Fibre + water, hot or cold = cellulose + water insoluble non-cellulose + water soluble non-cellulose.

3 Fibre in (2) washed = cellulose + water insoluble non-cellulose.

4 Washed fibre from (3) +alkali (boiled) = cellulose+residual non-cellulose+alkali soluble non-cellulose.

5 Fibre in (4) washed = cellulose+residual non-cellulose (useful for making wrapping paper, etc.).

6 Fibre from (5)+ bleaching powder (boiled) = cellulose+residual non-cellulose destroyed by bleaching.

7 Fibre from (6) washed = cellulose called half-stuff for making paper.

It can be seen from the above equations that plenty of running water is essential in paper making. That is why most of the paper making centres are on the banks of rivers and streams. The preparation of the half-stuff is the first broad stage in paper making. Generally speaking this stage is concerned with the disintegration of the fibrous material.

137 PAPER

The next stage is the conversion of the half-stuff into dry sheets of paper. Though textiles and paper both use cellulose as the basis, there is a fundamental difference. The former is made only of cotton, flex and certain other leaf fibres. In textile manufacture the long fibres of filaments of cellulose are spun and twisted in series so as to form a thin, strong and long yarn or thread. The yarn is then woven. But in paper making it is the opposite that takes place. The fibres and filaments are separated from one another, cut and bruised. The long thin walls of the fibres and filaments are more or less completely separated from one another, bleached and then beaten so as to break the individual cells into fragments about five or six hundredth of an inch in length. Wood-fibres too may, therefore, be used for paper but not for textiles. During the beating operations, all the loading, sizing or colouring materials are added to the pulp. The resulting pulp is diluted with water to 1% consistency, screened and passed into a vat. This stuff is lifted in a mould consisting of a frame across which reed-mat or wire-cloth is tightly stretched. As the water of the pulp drains through the mat or cloth, the mould is continuously shaken and thereby the fibres are made to felt together at all angles to one another. The wet sheet of paper which is formed is pressed between felts so as to sqeeze out the surplus water and then dried. Again it is pressed to remove all irregularities and dried and calendered whereby the dull rough surface is changed into one that is more or less polished and smooth.

14 Origin

The history of the shifting of the focal centres engaged in paper making will be an interesting index to the history of migration of renascence across the surface of the earth. As present knowledge goes, the wonder material of paper was invented in China at a time when it was bubbling with intensive life. Creation of new thought was at a high pitch in China during the few centuries before the Christian Era. The writing of books on wooden strips was cumbersome and the writing of them on silk cloth was expensive. The resulting social pressure led the Chinese to the invention of paper. Its invention is attributed to Ts'ai Lun, a court official, in the year 105 A.D. The raw materials used by Ts'ai Lun is said to have been old rags, hemp waste, fish nets and bark of trees. In the succeeding years the new craft spread throughout the Chinese Empire including Korea. The Swedish explorer Sven Hedin had unearthed, from Lonlan, paper dated 264 A.D. The invention of ink from lamp-black in 400 A.D. made writing easier and brought paper into universal use in preference to the older materials. By 674 China felt the incidence of ravage of insects on paper. There was therefore an edict which made it compulsory to use toxic vegetable substance for the colouring of paper. In those far off days Japan was depending on China for its inspiration. This led to the migration of paper from China into Japan about 610. The Chinese defeat in the battle of 751 in Turkistan led to some Chinese paper-makers becoming prisoners in Samarkand. With their help Samarkand used its abundance of hemp and its numerous irrigation canals, to make paper. Even as late as the sixteenth century Samarkand paper elicited the praise of the Moghul Emperor Baber. By about 800, Samarkand paper found its way into

Bagdad and Egypt and by 950 as far west as Spain.

15 Migration

The following table indicates the further migration of paper :—

Year	*Paper Mills Established In*
1100	Morocco
1270	Italy
1322	Holland
1348	France
1390	Germany
1405	Belgium
1491	Poland
1495	England
1575	Mexico
1576	Russia
1690	United States

Guntenberg's discovery of printing from moveable metallic types in 1440 and the renascence increased the demand for paper and led to a widespread establishment of paper mills in Europe.

16 Paper Machines

Till the beginning of the nineteenth century all the paper was "hand-made". The development of printing and of paper making had been pushing each other up a spiral, as it were. The invention of rotary machine for printing demanded rolls of paper four to five miles in length. But hand-made paper had to subject itself to severe limitations of size imposed by the use of the hand-mould. As stated in section 125, the largest size of hand-made paper ever made measured only 100" × 70". It was for a newspaper in New York. Apart from the need for paper in rolls for newspapers, the quantity required for the production of books exceeded the capacity of making by hand. In fact scarcity of paper was keenly felt at the beginning of the nineteenth century with the result that there were legal restrictions put on the size of newspapers. The process of making of paper had to be speeded up and therefore paper-making machinery had to be invented. This social pressure was not long in producing the result. N.L. Robert of Paris succeeded after years of trial and error in taking a patent for paper-machinery on 9 September 1798. F. Didot, sponsor of this inventor, however fell off from him and succeeded in inducing Henry Fourdrinier, a stationer in London, to build a paper-making machine. As it often happens, the men with economic power became predatory and deprived the one with creative power of the material fruits of his creation. The first paper machinery was erected by Fourdrinier in England in 1803. His name has been immortalised by the application of his name as an epithet to paper-making machinery. But as for material fruits, he went the same way as all creative men. By 1851 the year of the exhibition in Hyde Park, 190 paper-machines were turned out. One of these was brought to India. The speed of production reached by a machine today has exceceeded twenty five miles of paper per hour. The paper machine soon spread to all countries. In 1940 the machines in America were able to produce

15,000,000 tons per annum which are roughly equivalent to 300 lbs. per capita.

161 AUXILIARY MACHINERY

The machinery mentioned in the preceding section was only for converting diluted pulp into paper. But the demand for machinery was not confined merely to this second stage in paper-making. To feed the machinery at that stage, at the proper speed, it was necessary to introduce other machinery for all the operations in the first stage—cleaning, cutting, cooking, breaking and beating. Apart from this, the great increase in the quantity of reading materials produced and the application of paper to other uses, created shortage of linen and cotton rags which formed the chief raw materials till the beginning of the nineteenth century. This shortage led scientists to look for other raw materials. A shrewd observation made by R.A.F. Reaumur, a French naturalist, a century earlier, had suggested the use of wood-fibre. While observing the habits of wasps, he was attracted by the way they constructed their nests with wood-fibre. The walls of the nests so resembled paper that he wrote to the French Royal Academy in 1719, "They teach us that paper can be made from the fibres of plant without the use of rags and linen and some of them invite us to try whether we cannot make fine and good paper from the use of certain woods." He adds with great concern, "This study should not be neglected, for it is, I dare say, important. The rags from which we make our paper are not an economic material and every paper maker knows that this substance is becoming rare. While the consumption of paper increases every day, production of linen remains the same. The wasp seems to teach us a means of overcoming this difficulty." Of course it is well-known that the wasp seeks dry wood and makes out of it paper-like walls for its nests. Even as bats are said to have shown us the way to radar during our days, wasps had shown the way to wood-fibre as raw material for paper. Wasps became our teachers two hundred years before bats. It took nearly a century for this conjecture of Reaumur to be established in reality. In 1801 M. Koops took patents for making paper of different kinds of wood. The extraction of pulp from wood required special machineries. These subsidiary machineries came to be invented and improved upon in regular succession. The result is that paper-making has now become a branch of technology in which the engineer and the chemist work side by side and have equal responsibility.

17 India

P.K. Gode of the Bhandarkar Oriental Research Institute of Poona gives some references to articles which date certain paper manuscripts of India before the fifteenth century. This will be found in Appendix E of K.K. Joshi's *Paper making*, 1944, 205 to 222. Here is an abstract:—

Year	*Reference*
1180	R.A. Sastri: *On old mss* (*Bulletin* of Rama Verma Research Institute, 6, 1938).
1223	Bhular: *Indian palaeography* (*Indian antiquary* 33, 1904).

1310 Gough mentions a paper manuscript of *Bhagvata.*

1320 A dated manuscript of Vangasenas's *Vangadatta vaidyaka* exists in the Bhandarkar Oriental Research Institute, Poona.

1396 A.M. Shaw mentions in page 82 of his *Prasastri sangraha* of a manuscript of *Rishaba Deva charitra* which is partly on paper. It names that material "kagad"

The existence of these paper books does not warrant the inference that paper was made in India in those days. It might have been imported paper.

It is said that a Chinese interpreter who visited Bengal in 1406 refers to paper made in Bengal which was as smooth and glossy as a deer skin. But there is no continuity of tradition which leads us back to this centre for paper making.

171 MUSLIM PERIOD

It is believed that the craft of making paper came into India in the period 1420-70. Its introduction is attributed to King Buddshah of Kashmir. He is said to have brought some paper-makers from Samarkand and encouraged them to settle down in Nowshara. Although the craft is now nearly dying in Kashmir, this place still drags on to be a paper-centre. From Kashmir the craft migrated to Sialkot, Lahore, Delhi, Multan and Muttra. It also spread into Bengal and Hyderabad. There is for example a village in Bengal by the name "Kagaziguda". In Bengal 'Kagazi' is a surname.

171 Social Bibliography

The craft of paper making was largely confined to Muslims. It is conjectured that the Hindus avoided the craft since it involved the handling of used rag which was ritually unclean. Perhaps there was also another reason for the avoidance of paper. Paper came into India at a time when its recent cycle of decadence had begun. In a decadent phase, a community resists acceptance of anything foreign. This kind of resistance was witnessed by me in my younger days when temple priests refused to accept camphor packed in paper.

172 British Period

There was no attempt to make paper during the British period. Whatever paper was wanted was largely sent from England. For example when the English Society for Promoting Christian Knowledge wished to have the *Bible* printed at Tranquebar (a town in the Madras State) in 1711, it sent a hundred reams of paper along with a printing press. The Danish Mission which was in charge of the work felt that it must make its own paper locally. Accordingly a paper mill was founded on 13 January 1716. Twenty-two men were employed. Oxen were used to drive the machinery. But by 1722 the mill was closed and the printing press again looked to Europe for its paper. In 1870 the government began to employ convict-labour for making paper. In fact it became one of the chief industries of prisons. It was ordered that public offices should use only prison-made paper for all records in Indian languages. This policy is said to have unfairly affected the survival of private enterprise in paper-making.

Another factor that practically killed paper making as a cottage industry was the establishment of paper making machinery.

Mahatma Gandhi's drive for the revival of cottage industry gave some chance for making of paper recover.

173 PAPER MACHINES

The paper machine was first established in India in 1825 by Mr. Marshan of Serampur. But it did not meet with success. Another machine was brought to the country in 1851. By the year 1880, machines had been established in Calcutta, Gujarat and Lucknow. In 1903 the number rose to nine. The following are the fourteen paper mills which were working in 1948:—

1 Punalur Paper Mills Ltd., Punalur.
2 The Mysore Paper Mills, Ltd., Bangalore.
3 Andhra Paper Mills Co. Ltd., Rajahmundry.
4 The Deccan Paper Mills Co., Ltd., Poona.
5 D. Pudumjee Paper Mills, Bombay.
6 Gujarat Paper Mills Ltds., Ahmedabad.
7 The Upper India Couper Paper Mills Co., Ltd., Lucknow.
8 Rohtas Industries Limited, Dalmianagar (Bihar).
9 Bengal Paper Mills Co., Ltds., Calcutta.
10 India Paper Pulp Co., Ltd., Calcutta.
11 Orient Paper Mills, Ltd., Calcutta.
12 Shree Gopal Paper Mills Ltd., Calcutta.

13 Star Paper Mills Ltd., Calcutta.
14 The Titaghur Paper Mills Co., Ltd., Calcutta.

18 Message of Social Bibliography

Paper has now taken an important place in modern community. Amidst its multifarious uses —from toilet to building—the prepotent one is its being the physical vehicle for the communication of thought among contemporaries as well as to posterity. All progress and the very existence of humanity has to depend on intensive intellectual team-work-in-series to coax nature to increase her free gift of materials which can be used as food, clothing, or shelter with the least of fabrication, and even to supplement nature's gift by the creation of artificial materials with the aid of science. The very essence of intellectual team-work-in-series is communication. For unlike beasts man is not time-bound. Each generation can begin where its predecessor left its work. Apart from economic activity, political activity of every kind in a democracy depends equally essentially on communication. Administration has now grown to such a colossal size that its efficiency too has to depend essentially on communication of a detailed and exacting nature. Communication, whether it be for research, recreation or administration, has to be increasingly through recorded materials. This shows the vital part which paper plays in modern life. The part it has to play in the self-education and self-entertainment of an ever-increasing number of persons adds to the importance of paper in Social Bibliography. Its importance has become so great as to become the central theme of literary writings. E. Phillpotts's *Storm in a tea-cup* (1919) and J. Hergesheimer's *Foolscap rose* (1934) are novels woven round paper.

181 QUANTITY

As measured by mere quantity, India is fai behind world-standard in the amount of this wonder-material forming the very basis of Social Bibliography. Let us compare with the United States of America, the land of libraries. It has a population of 135 millions, of whom 85 per cent are literate. Imagine the wide range of books—from those for nursery children, through those for the active adults, to those for the old seeking solace in reading. Imagine the number of newspapers, periodicals and books in all the most diversified pure and applied sciences, humanities and social sciences on which books are needed. It is no wonder that the annual paper requirement per capita is 300 lbs. making an annual total of 15,000,000 tons of paper. India produces each year only a total of 150,000 tons, and imports about 300,000 tons. Even with only 15 per cent of our people literate, we feel paper-famine, as we get only 6 lbs per capita. None of our newspapers exceeds in size one-fourth of American newspapers. The number of newspapers is not even a hundreth. Periodicals are even fewer. We do not have sufficient books for adults; nor for children. But India is bubbling with new life. In spite of the indolence of the older generation, born out of life-long frustration by political denial of opportunity to grow and to 'become', the political independence which Mahatma Gandhi, the Father of the Nation, has won for us is seen to have been but a concomitance of the daringness, the zest for life and the determination to develop, on the part of the rising generation. With only 50,000,000 literates the paper now available in the country gives only 6 lbs. for one literate person. Even to equalise our literate's per capita consumption with America's we should have 7,500,000 tons and to be self-sufficient we should make 7,350,000 tons more per year. When illiteracy disappears, say by 1980 we should produce 45,000,000 tons of paper per year. Our production must be increased a hundred-fold.

This is the first message of Social Bibliography to India as formulated by the First Law.]

182 QUALITY

The quality of the paper now being produced is not helpful to make books either inviting or strong or durable. Calendering is poor. Bleaching is not effective in all cases. The tint is not restful to the eye. Non-cellulose material is not fully removed from the raw material. Too great a proportion of mechanical pulp is added to the chemical pulp. The result is that the paper fades in colour in three or four years. It turns yellowish. It becomes brittle. It becomes repulsive in every way. When we handle an American book or periodical, the involuntary remark it elicits from us is "What a fine paper!" The sense of luxury, comfort and pleasure it induces in us helps the willing use of books. It has to be remembered that no matter how beautiful calligraphy or typography is, if the quality of the paper is not in keeping with its scheme of design, the book loses much of its value in use. The quality of the paper produced by us should be improved to a high level.

This is the second message of Social Bibliography to India as formulated by the First Law.

CHAPTER 2

SECOND LAW AND THE MIRACULOUS ART

The First Law's chief contribution to Social Bibliography has been seen to be the use of paper as the base of the physical medium for communication. We shall next ask the Second Law about its contribution. We shall first take the Second Law in the form "Books for All". The Second Law asks us to look at the inside of the book. It has something to say about (1) the mode of recording, (2) the disposition of the lines, (3) the shape of letters, (4) Size of letters, (5) Illustrations and (6) Standardisation of script. It may have also something to say about the size of books and about their binding.

21 Mode of Recording

When the anti-Second Law "Books are for the chosen few" was ruling, it often happened that only a few copies of a book were required. Sometimes even a single copy proved sufficient. In such circumstances writing with hand often proved to be an adequate process. But when the Second Law began to insist that books were for all, the manual mode of recording proved inadequate and impracticable. The number of copies of a book required became too large for manual recording.

211 Block Printing

The first incidence of the influence of large numbers on the mode of recording is seen in a pretty Japanese tradition. Sometime between 767 and 780 the Empress Schotoku of Japan ordered the preparation of a million copies of a *Dharani* (=Prayer). For, her guiding principle was "Prayer Book foi All". This is the earliest recorded adventure of the Second Law. Even if a scribe could write 10 copies a day, it would have needed a hundred thousand days. Even if a thousand scribes had been put on the job, it would have taken a hundred days. But thousand scribes could not be found. A necessity arose to multiply copies more quickly than by writing and with far less men than for writing. Necessity is the mother of invention. In this case it led to the first miracle in multiplication of copies. The inventor cut the letters of the prayer in reverse on a block of wood. To'ul Lun's invention of paper in 105 A.D. and the subsequent invention of ink from lamp-black in 400 A.D. were used and the miracle of producing a million copies of a piece of writing in a short time with only a few hands happened. This was Block-Printing. This was the first phase of the art of printing. Copies of the first printed book are said to be still available in certain Japanese temples. A few copies are also said to have been acquired by museums in western countries. It is interesting to know that the language of this first printed book was Sanskrit though the characters in which they were printed were Chinese.

212 MARCH OF FIRST PHASE

The range and march of this first phase of the miraculous art conjured by the Second Law was extended and quickened by the cultural leaven of

Buddhism which came spreading from India. Here are the dates:—

780 Printing of the *Dharani* in Japan.
868 Printing of the *Diamond sutra* in China. It was a roll sixteen feet long. A copy was found by Aural Stein.
932-53 Printing of the collected works of Confucius begun.
950 First folded book made in China.
972 The *Tripitaka*, the sacred books of Buddhism, printed in China. Number of pages 130,000.
994 Printing of dynastic history in China.
1250 Block-Printing reached Egypt.
1423 Block-printing reached Europe.

22 Moveable Type

The pressure of Second Law went on increasing in intensity for about three hundred years. But as social decadence set in thereafter, the pressure began to decrease. Still the momentum of the first phase led to the invention of moveable types in China in 1049. The momentum was so weak however that it took four centuries for three founts to be made. These were all in Korea. Here are the dates:—

1049 Invention of moveable type.
1390 Type-foundry established by order of the King.
1409 A book printed from types in this year is known to exist.
1420 Second fount of types made.
1434 Third fount of types made.

By this time the force of inventive spirit had spent itself out. Eastern society had gone to sleep. As a result, the Second Law lost its strength and Social Bibliography stagnated in the East.

221 Waking of the West

However, as the renascence set in the east, it rose in the west. The evening twilight of the east synchronised with the morning twilight of the west. As usual the parts of the world worked in relay. Travellers like Morco Polo carried the pollen unconsciously in their feet from the mature flower of the East to the freshly blossoming flower of the West. The intangible way in which the relay is done is so inscrutable that mere intellectuals call it chance. But if happenings are seen in their global, infinite context, there is nothing that is a freak to be explained away as chance. As the East dropped into sleep, the West shook off from sleep. The movement of renascence was at a quicker pace in the West. The interval between the invention of paper and printing was seven centuries in the renascence of China. But the interval between the acceptance of paper and of printing was only one century in Europe. Social Bibliography began its work with redoubled vigour backed by the surging Second Law. As the medaeval conceptions dissolved before a new type of mind, the demand for books overreached the capacity of scribes copying books one by one. Even making blocks and printing therefrom proved too slow for the growth of demand. Thr right man appeared at the right time. Gutenberg of Mainz in Germany began somewhere about 1440 to grope for his type-mould and his punch-cutting to make matrices to be used with his mould. As it happened later with the inventor of the paper making machine, a capitalist first backed him, soon became impatient, and pursued him prematurely in a court of law. But Gutenberg persisted and completed the printing of the now-famous printed *Bible*, called *Mainz Bible* and 42 *line Bible.* This was in 1455. Copies of this exist to-day.

222 March of the Second Phase

The range and march of this second phase of the miraculous art conjured by the Second Law carried the printing side of Social Bibliography throughout Europe with surprising rapidity in spite of slow-moving transport. Here are the dates :—

1456	Germany
1465	Italy
1468	Switzerland
1470	Holland
1473	Belgium
1474	Spain
1476	England
1482	Denmark
1483	Sweden
1483	Portugal
1577	India
1589	China
1591	Japan
1593	Phillippines

The Jesuits were responsible to the dragging of printing into Asia which was lying in a state of exhaustion.

The attempt of Social Bibliography to come back to the East, with the help of the Jesuits, virtually fissiled out. The East had not yet recovered.

2221 Incunabula

The books printed in the first fifty years of the second phase—*i.e.* printed, say, before 1500—are called incunabula (=cradle books). Most of the extant copies of the incunabula have been rounded up. Paleo-bibliography has reconstructed every detail of the incunabula-age with uncanny thoroughness.

223 THREE CENTURIES OF CONSOLIDATION

One of the first specialisations, in the complex art of printing, was the separation of the type-founding trade from the printing trade. This happened gradually in the sixteenth century, at the end of which it was well-established. The type-founders went on improving the type-faces. The printers went on making minor improvements in the press. With the then knowledge of engineering, no revolutionary changes were possible. The demand for more books for more people did not shoot up till the beginning of the nineteenth century. Social pressure was low. What little pressure there was could only lead to the establishment of more presses or the enlargement of existing ones. It took 200 years for wood to replace iron in the building of the press and the lever to replace the screw.

23 Advent of Machinery

As the nineteenth century dawned, Europe was simmering with new life. A spiral motion started, which intensified the call of the Second Law and transformed the printing part of Social Bibliography to meet that call. Parts of Europe were bathed in a wave of democracy. There was a re-distribution of wealth. This doubled the demands of people. There was a sudden rise in the standard of life. This included rise in the number of those who looked for books. The rise in the standard of life among the masses needed the production of everything on a larger scale and at a greater speed. The scale and speed wanted more hands than could be spared by society. This was as true of production of books as of everything else. The invention of machinery was the only solution. And machinery was invented. More of informed men were necessary to make machinery produce at the new rate needed by society. This in turn demanded production of more books and at greater speed. This spiral rise which started in 1800 is still accelerating without abatement. This spiral is the characteristic of the third phase in the miraculous art.

231 MARCH OF THE THIRD PHASE

The industrial revolution which began about 1800 has passed through three stages:—

1 Steam power and the grosser and massive engineering;
2 Electrical power and the finer engineering; and
3 Chemical technology and photography.

It is now entering the fourth stage which may be called the "Electronic Stage" with all its versatility.

These stages are reflected in the third phase of the development of the art of printing. Steam-power led to the invention and the continuous improvement of the printing press. Electrical power led to the invention and the continuous improvement of composing machines. Chemistry and photography first led to photo-chemical methods in the preparation of blocks for printing illustrations and then to planography or printing from plane surface as in offset printing. Electronics is now leading to a new flair of inventions, which promises to fit Social Bibliography to meet the most exacting demands which the Second Law has begun to make. Let us trace the march of the Third Phase of the art of printing through all these four stages. We shall trace the evolution of the printing machinery, plate-making process, and composing machinery and process.

232 MACHINERY FOR PRESS WORK

The major terminal operation in printing is in essence the transfering of ink from type-surface to paper-surface. Pressing the sheet of paper on the inked type surface was the obvious process.

2321 Hand-Press

The press used for making wine or for pressing linen or the screw press used by paper makers for nearly a century was adapted to this purpose. The first hand-presses of 1440 were made of wood. They were massive in order to secure rigidity and to withstand the wear and tear of heavy use. The first improvement on this was the replacing of wooden screw by metal screw in 1550. The next improvement was the introduction in 1620 of the Blaew press where the platen (=the pressing plate) was suspended and the bed which had the form to be printed slid under it in a travelling carriage. The third improvement was made in 1800 and that was made by Earl Stanhope. He introduced all-iron press and levers to work with platen along with the screw. The introduction of the lever increased the speed of production to 200 impressions an hour. The lever hand-press reached its zenith in 1823 when the Albion press employed a lever with toggle-joint (=knee-shaped joint). As only muscular power was used to operate the screw or the lever, this class of printing press was called "hand-press". This was the first phase in the evolution of the printing press. Although this phase ended at the turn of the nineteenth century, the hand-press was revived by William Maurice and used in his famous Kelmscott press. These were christened "hand-printed books". No special quality attaches to a hand-printed book though "hand made-paper" has superior quality as against machine-made paper.

2322 Cylinder Machine

The replacement of a plate by a wheel has been the most outstanding event in all the mechanical aids invented by man. Printing press is no exception to this. However it took three and a half centuries to be effected in the printing press. William Nicholson took a patent in 1790 for a cylinder machine. But it went unnoticed and unused for nearly twenty years. The increase in demand for books created by the Second Law had not then reached the necessary intensity to see the superiority of the value of the cylinder to the flat-plate in the speed of printing. But by 1810 the expansion of literacy and the industrial revolution burst into the European world with the spiral development of inventive mechanical genius and the demand from the Second Law to stimulate it. The first "cylinder machine" became an accomplished fact in 1812 due to the effort of Friedrich Koenig employed by the *Times*. The *Times* also replaced muscular power by the newly invented steam-power. This increased the speed of production to 1,000 impressions per hour. An improvement over the cylinder machine was the "two-revolution machine." This is a flat-bed cylinder machine in which the cylinder revolves continuously without stopping. It makes two revolutions for each impression. The sheet is printed during the first revolution. Then the cylinder is raised to clear the forme. The sheet is replaced during this stage. In contrast to this the original cylinder machine was called "stop-cylinder machine". About this time inking also was done automatically by machinery. The speed acquired was sufficient to meet the then demand of the Second Law. In 1822, for example, Ree's *Cyclopaedia* of 41 volumes could be printed with comfort. It is said to have consumed 30,000 reams of paper. The paper consumed is a measure of the extent to which the Second Law triumphed in the number of copies printed to serve a large number of readers. These machines print on both sides of the sheet not exactly simultaneously but consecutively before the next sheet is taken up. They are therefore called "Perfectors". It is the advent of steam-engineering that made this possible.

2323 Automatic Feeding

Though the speed of printing was satisfactory the number of men needed to feed the sheets of paper to the gauges one by one by hand involved wastage of manpower. Several operatives were required to feed paper. To eliminate this wastage of manpower, the "automatic feeder" was invented in 1920. It was the creation of electrical and pneumatic engineering. It is truly a robot. It picks out each sheet from the pile, guides it carefully to the feed gauges and sees that the grippers take safe hold of it. If two sheets are struck together or if the sheet is torn or incomplete or it jams anywhere on the feeder because of crumpling and if the cylinder fails to take hold of it or if anything else untoward happens, the robot stops the press. It also stops the press when the last sheet in the pile has been fed. It is the advent of electrical engineering that made this possible.

2324 Rotary Machine

By the middle of the nineteenth century literacy had spread quite widely. Though books did not come to be widely read, newspapers became very popular. By their very nature copies of newspapers had to be multiplied at a tremendous speed. With only 2,000 impressions per hour, several formes would have to be composed and printed simultaneously on several machines. This would involve more money and more man-power than society could afford. This social pressure created by the Second Law put the engineer on the alert. He found that he had done all that he could to increase the speed by making the pressing part of the machinery a cylinder. The only part which was in the uneconomical flat-form was the printing-surface on the bed. If this too could be converted into a cylinder, the desired result would be got. So it was. Applegarth and Hoe prepared curved stereo-types of the type-surface. To take full advantage of the two cylinders revolving at terrific speed, paper was made as a reel. The "Web" wound in cylinders could be fed by this reel between the type-cylinder and the press-cylinder at the right speed. Moreover any number of units can be built up in decks or placed in line. This means any number of pages can be printed at a time. It is not unusual to have 64 pages of newspaper size printed at one time. Paper reels are made in suitable size for this purpose. To take full advantage of this terrific speed the Hoe press has also super-speed folders attached to it. It has also multi-coloured units for colour work.

The speed attained was 25,000 copies per hour, 60,000 is now possible.

The speed of offset machine is even greater. In gravure-printing the speed has now been increased to nearly a 100,000 impressions per hour.

Increase of speed is really a matter of increasing the number of revolutions of the cylinder per hour.

But there is a limit beyond which the increase in number of revolutions will land us in supersonic speed. For cylinders of three feet diameter, this supersonic limit will be reached with 400,000 revolutions or impressions per hour. If the number of impressions reaches that limit the surrounding air will cut away the paper and everything else that comes near it, as if it were the sharpest of razors. If the Second Law wants a greater speed of production, Social Bibliography should look for economy in time in operations other than that of striking copies.

233 PLATE MAKING METHOD

Nearly a century before machinery made speed-printing possible, the demand of the Second Law for a large number of copies had to be met by other methods. The only course open was to print the same subject matter in identical form at the same time in a number of different places. This is called printing in "gangs."

2331 Stereotype

To compose the matter *ab initio* in each of the places would involve prohibitive cost. To meet the situation the stereotype was invented in 1727. William Ged of Scotland was the inventor. Incidentally the stereotype method effected considerable saving of wear and tear on expensive type metal and the original blocks for illustration. For the relatively small cost of stereo, the original block is insured against the risk of deterioration or accidental damage which use on the machine would involve. Also the type is released much earlier for other purposes with a consequent economy in time and capital outlay. These incidental advantages gained considerable weight when steam power was introduced in 1812. This led to the invention of a cheap "moulding flong" called "papier-mache", in 1814. It is made of tissue and blotting paper pressed together by a special paste in alternate layers. The *Times* of 29 November 1814 was the first newspaper to be printed with the aid of it. When the rotary machine came, the stereotype lent a helping hand in making cylindrical plates possible.

2332 Electro Type

After entering the era of electricity, electrical method of preparing a solid plate as printing surface came into vogue. Electricity also helped in the strengthening of the face of the stereotypes as well as electro types with harder metals like nickel and chromium, according to the requirements of the run. Here is a comparative table:—

Metal of the face	**No. of Impressions**
Lead	25,000
Copper	40,000
Nickel	300,000
Chromium	700,000

This is an extraordinary service that electrolysis is rendering to Social Bibliography to fulfil the demands of the Second Law.

2333 Planography

During the last half a century, chemistry and photography are enabling the replacement of relief plates by plane plates. Typography is being replaced by planography. The foundations of planographic printing and its improvement have invited the chemist to work in co-operation with the engineer. The preparation of the impression cylinder, the rubber surface for the blanket cylinder and the lithographic ink are all based on chemical research. The first offset process was patented by Robert Barclay in 1875. However, it was used only for printing of metal sheets. It was only many years later that the process was applied to printing of paper. This has not yet been fully exploited.

234 COMPOSING MACHINERY

We have seen already at the end of section 2324 that there is a limit beyond which press work cannot be speeded up. Though the rotary machine is able to produce copies at the rate of 100,000 per hour and though this is proving to be sufficient today, we have to remember that the Second Law has not yet been fulfilled even to a measure of 40% in any community. If you take a country as a whole, it is not satisfied even to the extent of 10%. As its demand increases the speed of supply will have to be much more than what can be secured by the improvement in press-work alone.

At the turn of the present century the demand of the Second Law exceeded the then capacity of press-work. As electricity had established itself firmly by then as a source of power, Social Bibliography turned to it and asked if it could not help the establishment of a machinery by which the time consumed in composition could be reduced. For, till 1900 to compose a book meant picking up each letter singly and assembling it with others. Compositors no doubt acquire a marvellous speed by practice. They could assemble 1,000 letters per hour or roughly 200 words. But there is a limit to the speed of the fingures. The "All" in "Books for all" wanted composition to be done at a greater speed. More books were wanted than could be composed at this low rate of hand-composition. Necessity again became the mother of invention. Thr problems that appeared to present insuperable difficulty were:—

1 Justification or the spreading out of the line to its full length; and
2 Distribution of the types after printing the book.

2341 Linotype

After several attempts and failure, O. Mergenthaler of America invented the "Linotype" in 1890. In one sense it appeared to turn the hand of the clock back. For it brought back type-foundry into the printing office. Indeed the type-foundry was incorporated in the machine itself! Secondly it abandoned the principle of movable type and cast a solid metal strip or slug carrying a whole line. This machine however solved at once the three problems of composition, justification and distribution.

After continuous improvement the linotype has now become a machine of great flexibility.

2342 Monotype

In 1897 Tolbert Lansdon, another American, invented the "Monotype". This machine separated the type-foundry from the composition room. It also reverted to movable types. It allowed a greater range of type faces than the linotype.

The achievements of engineering at the speed of composition is shown by the following table:—

Year	Method	Speed per hour
1440	Hand	1,000 letters
1890	Linotype	10,000 letters
1897	Monotype	40,000 letters
1952	Photo-composer	120,000 letters

235 PANTOGRAPH

This mechanical composition involved the composition of matrices and not of types. Therefore the demand for matrices multiplied. This in its turn multiplied the demands for punches from which matrices are made. (These terms are explained in section 71). This created the demand for mass production of punches. If the fifteenth century method of cutting punches by hand had continued, the mass production of punches would have been impossible and the usefulness of composing machines would have been seriously curtailed. But the right thing had happened even a decade before the composing machine was invented. In 1884 L. B. Benton of America had already invented a punch-cutting machine on the pantograph principle. This machine really played the role of preparing the ground for machine composition.

236 DIRECT FROM TYPESCRIPT TO PRINTING PLATE

The Second World War gave a special impetus to the reproduction of books direct from typescript through duplicating machines of the offset type. For this purpose special typewriting machines have been developed, e.g. the Vari Typer, thr D.S. J. Coxhead Composing Machine, the I.B.M. Electric Typewriter and Justowriter. All these machines justify lines. These methods by-pass the composition of types. It also saves the time needed for proof reading. But the type-faces are yet to be improved for the production of these books on a large scale to the satisfaction of the Third Law of Library Science as well.

237 PHOTO COMPOSITION

From 1946 announcements have been coming that a photo-composing machine was being devised. It was said that it consisted of five basic parts:

1. Electric typewriter;
2. Memory unit;
3. Electrical computing and control system;
4. Automatic photographic unit; and
5. Automatic stripping machine.

It is claimed that the operation is at a speed of ten average-width lines per second. Here too metallic types are by-passed. The script is composed photographically on a film and thereafter, in a continuous process, the various stages are gone through and the plate is delivered to the offset press. It is said that there was a symposium on this subject of photo-composition at the meeting of the Philadelphia Book Clinic held on 13 November 1951. It was announced at that meeting that a 200 page book entitled *Basic micro technique* was being composed by a photo-composition method and that it was about to be published.

With photo-composition Social Bibliography may be said to enter its fourth phase under the urge of the Second Law of Library Science.

24 Special Classes of Books

The major development in printing described till now concerns the elements of Social Bibliography answering the Second Law in the form "Books for All". We can get a view of some details in the printed books and of certain other forms of physical embodiment of thought or communication if we follow the Second Law in the form "Every reader his book". For purposes of Social Bibliography there may not be need to consider individual readers. It will be sufficient if we consider classes of readers. Accordingly we shall take up, in order, (1) Busy Persons, (2) Strap-hangers, (3) Travellers, (4) Children, (5) Neo-literates, (6) The Cripple and (7) The Blind.

241 BUSY PERSONS

Busy persons often need some information which they do not remember. The Second Law has cared for this need and stimulated the production of reference books. These reference books are not fit to be read through. They pack information in short paragraphs and sometimes even in single lines about various topics. These are arranged alphabetically. They really function as "externalised memory" to busy readers. They merely turn to the right page and to the right line to recall to memory something which they had forgotton or to pick up information which they do not know. Their needs are that they should take within a single sweep of the eye as many entries as possible, so that they can, with comfort and readiness, locate the particular entry which they are seeking. To help this class of readers, Social Bibliography would advocate printing in small type, say eight point. Even six point is used in several reference books. Secondly such books are printed solid, *i.e.* without space between lines.

242 STRAP-HANGERS

In big cities people are obliged to live in suburban areas and reach the heart of the city every day for their daily work. This often entails travelling by crowded trains, trams or buses. Nearly a third of the passengers have to stand holding the strap during the rush hours. They have to be in this posture for more than half an hour and often even for an hour. One of the means of relieving boredom in this unenviable posture has been found to be the reading of books. With the left hand holding the strap, the book is to be held in one hand. A book with a stiff binding will not lend itself to this. It is therefore necessary to have books of light literature for reading in those conditions. These should be paper-covered or provided with a limp cover. Another desirable feature in the books for strap-hangers should be that they should be small enough to be pushed into the pocket when they get off from the vehicle.

243 TRAVELLERS

Sometimes people who have to travel long distances like to carry books for use during forced confinement in trains and boats. They would like to have as many reading materials as possible in as little a compass as possible. This is secured by printing an edition in India-paper which has been already described in section.

25 New to Reading

The Second Law is specially solicitous of the needs of children and neo-literates who are just being initiated in reading. Social Bibliography has a message to printers in regard to the books for this class of readers.

251 CHILDREN

We should begin the infant readers with types of size 72 to 60 points. The size of the type can be decreased gradually. Probably the books to be read after the first year may be of sizes varying from 48 to 36 points. Books to be read after the second year may be in types of sizes 30 to 18 points. By the fourth year, 12 point can be reached with comfort. There is a fallacy among the adults about the thickness of books. They believe that only thin books, of which an inch will take a dozen, are suited to children. This is not at all a correct view. Children should be given a sumptuous book which fill their tiny hands. The number of pages will naturally increase with the age of the child as the type of the size is decreased. Another factor which will swell the size of the book for children in the earlier years is that there should be plenty of pictures in them. The children's books are also to be given a thick binding.

252 NEO-LITERATES

The adults who have had no opportunity to learn the alphabet or to read in their childhood, feel a great handicap if they seek to acquire literacy in a later age. Till they reach their adult-hood they are accustomed to pick up ideas in the form of sound, or in the form of things visible or pictures. The phonetic representation of ideas is extremely artificial. If initiated into this artificiality while the mind just begins to develop, the written or the printed word has a chance to be included among natural entities. But in the case of illiterate adults there is a great resistance to this attempt of the printed word to pass for something natural. The neo-literate adults have therefore to be provided for even with greater care than children. A suitable gradation of type-size is necessary in the books for neo-literates according to the age of literacy of the adults.

26 Abnormals

There are two classes of abnormals for whom special forms of books have been produced. They are the cripple and the blind.

261 THE CRIPPLE

The Second Law feels a special responsibility in regard to the unfortunate cripples who have to be confined to bed. Though physically crippled, they may be mentally normal and alert. Confinement to bed denies to them other sources of enjoyment and exposes them to boredom. Books can therefore be a great solace to them. The Second Law would ask Social Bibliography to remember them. We are thinking of cripples who have to be lying on their bed and who are not able to use their hands to hold the book or to turn the pages. To meet their requirements, Social Bibliography has promoted the production of what are called "ceiling books". These are really books in films. The ordinary book is filmed and put in a special compact projector. This book can be had at a convenient place on the bed of the cripple. By turning the switch the pages of the book can be projected on the ceiling. A simple mechanical device can be provided by which by mere touch the pages can be changed. I saw such ceiling books in the Public Library at Pitsburg. It is a great boon to patients—even to ordinary patients who are temporarily confined to bed.

262 The Blind

The Second Law's solicitude for the blind, made Social Bibliography look out for suitable forms of books for the benefit of the blind. Since the sense of sight is denied to them, they have to depend upon the sense of touch or the sense of hearing to pick up communications which are usually picked up through the book by those who are sighted. In 1827 "braille book" was invented for the benefit of the blind. Here the letters are coded in embossed dots. A whole book is produced in this manner. Its bulk is five or six times that of the printed book. Several thousands of books have been brailled. Usually it is the National Library for the Blind that produces this book. In recent years "sound books" have been produced to enable the blind to read through the ear, as it were. In the United States the Library of Congress is producing sound books on demand. Some of the city libraries too are doing similarly. I saw the organisation for it at the Cleveland Public Library in 1950. I myself recorded a plate in Tamil in the same way in which books are recorded for the blind in that library.

27 India

Although Portuguese Jessuits brought printing in India within a century of its invention in Europe, India's state of prostration prevented it from adopting this miraculous art. Till the middle of the nineteenth century the people of India had not taken to printing either with understanding or with eagerness. Thereafter quite a number of presses were established. But they were all mostly either for newspaper or for job work. Good printing of books began to develop only in the twentieth century. Even then the best presses were those owned by foreigners. Some of these presses changed to Indian hands after the independence of 1947. Being new to the independent management of institutions in general and to the technique of printing in particular, these presses appear to be going through a phase of incohateness. But the all-enveloping democracy and the irrepressible bubbling of new life will before long bring up printing to a level which Social Bibliography would like to have in order to satisfy the Second Law of Library Science. I give here a short account of early printing in India.

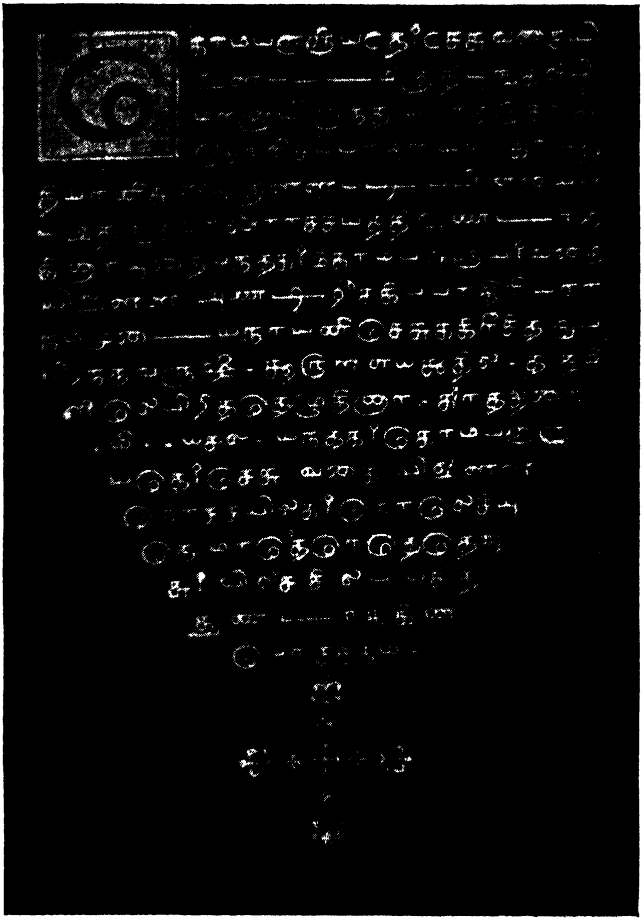
271 PORTUGUESE

It was in 1556 that Portuguese Jessuit fathers established in Goa the first printing press of India. It was begun with a printing press which the Jessuits brought with them from Portugal. The first printer was John of Bustamente. He is said to have had an Indian printer trained in Portuguese to assist him. The first book printed in this press was *Conclusoes* of Antonio de Quadros, a professor in the College St. Paul. No copy of this book appears to exist now. In the next year a catechism entitled *Dontrina christo* by St. Francis Xavier was printed at the College of St. Paul. A copy of the third book *Compendio spiritual de vid a christao* by Gaspar de Leao printed in 1561 is said to be found in the New York Public Library. This press appears to have been closed down in 1573. Another press was opened in 1616 at Rachol near Goa. This press worked till 1668.

272 TAMIL

2721 Ambalakkadu

The first printing in Indian characters was done at a place called Ambalakkadu in Cochin. The place is now a small village, but about 1550 the Jessuits built here a seminary and a church. Sanskrit, Tamil, Malayalam and Syrian were studied there, and a press was established where several important works were printed. The first 'Malabar' types were cut by a lay brother, Joannes Gonsalvez, in 1577, but there is no evidence left to show whether the characters were what we now know as Malayalam or Tamil. The word 'Malabar' seems to have been used by Europeans to describe both languages, and even so late as 1809 the Tamil-English Dictionary of Fabricius is still described on the title page as a 'Malabar and English Dictionary'. It has not been found possible to trace in India any of the books printed at Ambalakkadu, but there is in Rome a list drawn up by Fr. Paulinus, and an Indian who has seen it had stated that the names of the books appeared in Malayalam characters, and the probability is that normally they were used for printing both Malayalam and Tamil books. If this is the case, then an interest-



A page of an Early Tamil Book

ing story lies behind a record left by Fr. Paulinus. He tells us that in 1679 a Tamilian by the name of 'Ignatius Aichamoni' cut Tamil characters in wood for the printing of a Tamil-Portuguese Dictionary compiled by Fr. Antem de Proenca of the Madura Mission. It would seem that the Madura Jessuits had discovered that the Malayalam characters were not understood in the Tamil country proper, and de Proenca insisted on Tamil characters being used. He would probably have sent Ignatius, a local woodcarver, to cut the letters for the key-words. It would have been extremely difficult to produce separate characters in wood, so probably the words were carved on small type-high blocks.

Type was cast at Amsterdam in 1678 to print the names of some plants in the book *Horti Indica Malabarici*. Ziegenbalg, the Danish missionary who worked at Tranquebar on the East coast, mentions the fact that Tamilians could not make them out. Here too it is probable that the first Amsterdam types were Malayalam. If so the claim of Ignatius of Madura to be the first Tamil type-cutter seems well established. Unfortunately Ambalakkadu was destroyed by Tippu when he invaded Cochin and Travancore. He spared neither Christians nor Hindus; church, seminary and press went up in flames, and practically all the books and valuable manuscripts perished.

2722 Tranquebar

A new era opened with the arrival of the Danish missionaries, Ziegenbalg and Plutschau, at Tranquebar in 1706.

In 1711 the Society for the Promotion of Christian Knowledge in London sent out a press with Roman types to Tranquebar. It was accompanied by a German printer by the name of Jonas Fincke. The ship was captured by the French off the coast of Brazil and taken to Rio. It was afterwards ransomed, and thus enabled to resume its voyage, but Fincke died off the Cape of Good Hope. The press and type, together with a stock of paper, were landed at Tranquebar in August 1712, and the missionaries were able to secure the help of a Danish soldier to erect and manage the press. A number of small books were printed in Portuguese. In the meantime, Ziegenbalg had sent specimens of Tamil characters to Halle in Germany, where a fount was cut and cast. The types were then sent out and reached Tranquebar soon after the press. The first book printed entirely in Tamil was the *Apostle's creed.* Two more printers were sent out, and one of them, Adler, became of great assistance both as a letter-founder and a mechanic. The Tamil letters sent from Halle were rather large, so he set to work on the preparation of a smaller fount. He also set up the first paper-mill in India at Poraiar.

The printing of the Tamil *New testament* was completed in 1715, and the translation of the Old Testament followed. This was completed after Ziegenbalg's death by Schultz, and printing was completed in 1727. A copy of this first edition, in five volumes, is still extant in the possession of the British and Foreign Bible Society, Madras. The

Tranquebar Press continued to function for nearly 200 years, and the bulk of Tamil printing was done there during the eighteenth century.

The Tamil type used at this period was upright and somewhat square in appearance. The characteristic slope and more rounded appearance seems to have been introduced by the Dutch East India Company's Press at Colombo. There is a fine quarto volume produced there in 1748, now in the possession of the Diocesan Press, Madras, which shows a very high standard of workmanship. Another excellent piece of printing is in Arndt's *True Christianity*, but this was printed at Halle in 1751.

2723 Madras

Printing in Madras started in rather a curious way. In 1761 Sir Eyre Coote captured Pondicherry from the French, and in the Governor's house was found a printing press and some types. These were brought back to Madras as part of the loot, but the Fort St. George authorities were unable to make use of them as they had no printer. Fabricius, the great Tamil scholar, was then living at Vepery, and the equipment was handed over to him on condition that if at any future time the Company should require any printing done, he would do it for them. This was the commencement of the S.P.C.K. Press at Vepery, now known as the Diocesan Press. It can thus claim to be, by many years, the oldest existing Press in India.

It was at Vepery that Fabricius printed his hymn book, and also his *Tamil-English dictionary*

(1779). The original wooden press was replaced by an iron lever press in 1826. It is uncertain when Tamil types were first cast in Madras, but it must have been somewhere about the beginning of the nineteenth century. A new face was cut which was a great improvement on the Halle face, and this was used by the S.P.C.K. Press upto 1870.

Upto 1835 there were few presses in the country owing to the severe restrictions imposed on printing by the Company. In that year Sir Charles Metcalfe removed these restrictions, and Indian-owned presses began to be established. By 1863 there were ten such presses in Madras city, printing in Tamil on a small scale. Most of them were set up in family houses, and owned in common, some members of the family acting as printers, others attending to sales. In 1872 three or four printers had iron presses, and some even hot-pressed their sheets. Some books printed by them were of very good workmanship.

2724 Peak-Period

We now come to what may be termed the peak of Tamil printing under the old conditions of hand-cast type and hand presses. The American Mission had set up a press in Broadway, and for many years it was under the management of a very fine printer, Mr. P.R. Hunt. About 1850 the question arose of the printing of a new and large *Tamil-English dictionary* which was being prepared by the Rev. Miron Winslow. It was the biggest venture so far attempted by any press in South India, and Hunt was dissatisfied with the existing Tamil type-faces. He taught some of his workmen the difficult art of cutting type-punches by hand, and himself designed a new face. To some extent it followed the lines of that produced at the S.P.C.K. at Vepery at the beginning of the century, but he gave the letters a more regular slope, more even spacing, better alignment, and introduced a new and beautiful serif which greatly added to the appearance of Tamil type. Three founts were produced, Pica, Long Primer and Brevier. Printing was commenced in 1853, but owing to the reasons given in the preface of the *Dictionary*, it was not completed till 1862. Both composing and printing were of a very high standard indeed, and will, even today, stand in comparison with the work of any press in the world. In the middle of the nineteenth century there can have been few productions to equal it.

A close examination of the Tamil type reveals the fact that, if anything, it is superior to the Roman characters, which were the best imported type of the period. A few years ago, when an expert from the American Linotype Company visited Madras to make enquiries about the most suitable Tamil type-face for reproduction on the linotype machine, it was the unanimous wish of leading Indian printers and scholars that Hunt's designs should be used, a striking tribute to the affection in which they are held a hundred years later. The original punches were therefore sent to America, and in making new matrices the characteristics of the faces were carefully preserved, experts declaring that they could not be improved upon.

To-day, when people talk about the inferiority of printing done in India, and in their minds attribute it to a lack of ability on the part of the Indian workman to rise to the excellence of his brother craftsmen in Western countries, we can recall with pride that 100 years ago a Madras press was the equal of any press in the world, and in the difficult art of cutting punches by hand, Madras workmen were probably superior.

273 BOMBAY

The first attempt to establish a printing press in Bombay appears to have been made in 1670. In that year the Council of Bombay wrote to the Directors of the East India Company "Bimgee (Bhimji) Parrack (Parakh) makes his humble request to you that you would please to send out an able printer to Bombay, for that he notes a curiosity and earnest inclination to have some of the Brahminy writings in print, and for the said printer's encouragement he is willing to allow him £50 sterling a year for three years and also to be at the charge of tools and instruments necessary for him. And in case that will not be sufficient, he humbly refers it to your prudence to agree with the said printer according as you shall see good, and promises to allow what you shall order. It is not improbable that this curiosity of his may tend to a common good, and by the industry of some searching spirits produce discoveries out of those or other ancient manuscripts of these parts which may be useful or at least grateful to posterity." The Court of Directors thereupon engaged Mr. Henry as "Printer for the Island of Bombay and despatched him from London in one of their ships" with a printing-press, type, and a considerable quantity of paper. On his arrival in 1674, Bhimji was disappointed to find that Hill, albeit an expert printer, was not a founder and was quite unable "to cut the Banian letters"; and he therefore wrote once again to the Court of Directors who replied by sending out a type-founder in 1678.

Apart from this there is no other record about the press which is believed to have been established in 1674. In 1780 a calendar is said to have been published. In 1793 a book of 164 pages was published with the following title:

> "Remarks and Occurrences of Mr. Henry Becher, during his imprisonment of two years and a half in the Dominions of Tippoo Sultaun, from whence he made his escape."

The author of this book claimed in its introduction that this was the first regular book printed in Bombay. A copy of it is available in St. Xavier's College. It was picked up from a second hand book shop.

274 DEVANAGARI

The first attempt to cut punches for Devanagari types in India was made in 1795 by Charles Wilkins, Librarian of the East India Company. When he returned to England he prepared types, punches and matrices. With them he printed his Sanskrit Grammar in 1808, to teach Oriental languages at the East India College at Hertford. A copy of this book is in the Royal Asiatic Society Library in Bombay. In the introduction of this book Wilkins writes: "I cut letters in steel, made matrices and moulds, and cast from them a fount of types of Devanagari characters, all with my own hands, and with the assistance of such mechanics as a country villager could afford, I very speedily prepared all the other implements of printing in my own dwelling house; for by the 2nd of May of the same year, I had taken proofs of sixteen pages, differing little from those now exhibited in the first two sheets. Till 2 o'clock on that everything I had succeeded to my expectations; when, alas! the premises were discovered to be in flames, which spreading too rapidly to be extinguished, the whole building was presently burnt to the ground. Greatest part of punches and matrices was saved but types were ruined."

Colebrook's *Sanskrit grammar* was printed in Calcutta in 1805 at the East India Office, to teach Indian languages to servants of the East India Company.

275 BENGALI

Cutting of Bengali punches is also said to have been done by Charles Wilkins. He trained a local artisan Panchanan Lohar in this work.

276 MARATHI

The first book was printed in Marathi in 1807. It was a grammar book. Then followed the *Bible* in 1807. Next to that came a *Marathi-English dictionary* printed in 1810. All these are in Modi characters. Nana Phadnis of Poona printed the *Gita* in 1805 for presenting to learned Brahmins. The American machine press founded in Bombay in 1816 had only a single fount on Marathi type. Early in the nineteenth century Sarfoji Raja of Tanjore established a printing press to publish Marathi books on various subjects. A Marathi translation of Aesop's *Fables* entitled *Balabodha muktavali* was printed in this press in 1805.

277 GUJARATHI

Byramjee Jeejeebhai Chapgar produced Gujarathi type in Bombay in 1797. Drummond's *Illustrations of the grammatical parts of the Guzerattea Mahratta and English languages* was the first book to be printed in Bombay in 1808 in Gujarathi characters. The first Gujarathi press was set up in Bombay in 1812 by Mobed Fardunji. He himself cast letters. The later became the Mumbay Samachar Press. The first Gujarathi Panchang (=Almanac) was issued from this press in 1814. In 1815 a Gujarathi translation of *Dabistan* was printed by Fardunji.

278 PRESENT DAY

Today there are more than a thousand printing presses in India. But those that can produce books that satisfy Social Bibliography are very limited in number. Even among those to print books, it is the text-books prescribed by schools that loom large. About ten years ago it was estimated that in the State of Madras, which was well advanced in printing trade, only about 3,000 books were printed each year. Of these only about 300 can be taken to be to the satisfaction of Social Bibliography. This is far from what is needed by the Second Law of Library Science. Moreover the average size of an edition seldom exceeds a thousand copies. There is no doubt at all that printing and binding in India improved considerably till the beginning of the Second World War. But since then there has been a set back. The workmanship is poor. Illustrations are even poorer.

28 Message of Social Bibliography

If India is to benefit by its political independence, it must be possible to produce plenty of books on current thought in an attractive form. This will require the employment of highly qualified printers. To turn them out in adequate number, our technical schools should improve their standard. To attract really able men to the printing trade, the scale of salary should be increased and also stabilised. Printing machinery and most of the other requirements of the printing trade should be made in India. All this will naturally increase the cost of production. If the editions are within a thousand as they are now, this will make the cost of each book too great even for libraries. The only method of maintaining a high standard of book production and a low cost per copy is to increase the edition of each book. Some people argue that the edition can be increased only if there is only one language and one script for the whole of India. But this is not only an impossible condition but also a fantastic one to ask for. In reality no language in India is spoken by less than ten million people. Most of the languages are spoken by about thirty million people. This population is quite enough to produce an economic number of copies in each edition.

281 HOLISTIC PLANNING

It is here that statesmanship is required. We cannot leave this matter to be adjusted in a casual way over a long period of years. There must be proper planning—holistic planning. The development of social education, public library provision and printing should be conceived as a whole and tended as a whole. This is not impossible. Our Planning Committees do not however appear to have realised the importance of this sector in planning. In fact neither competent educationists nor librarians nor printers have been consulted in the matter. The views expressed by the Indian Library Association had never been looked into by the planning authorities. It is hoped that they will soon realise that to ignore this sector in planning will eventually court failure to working out their plan in every other sphere. It is never too late to mend. The first message of Social Bibliography is that the National Planning Commission should take up this matter in all seriousness and in its entirety.

282 LEAP AHEAD

The second message of Social Bibliography to India is "Leap ahead. Be quick". Do not make renascent India, which has come back to life very late in the day, foot through every stage in printing through which the already developed countries had gone. Your population is vast enough to make the latest large-scale-producing printing machinery economical. So far as illustrations are concerned, pool together the resources of all the constituent States, make the same blocks go round to illustrate books in the diverse Indian languages, skip through the laborious hand composition, and even machine composition. Adopt straightaway photo composition. Do not go after the printing machines which are rapidly getting outmoded. Go in for the latest double offset machine which completely eliminates the impression cylinder. This may mean training your young men in the latest phase of printing technique. This will also mean that the National Planning Commission should show greater awareness than it does at present to the important work of book production to the full satisfaction of all the Laws of Library Science. Then only India can derive the greatest possible benefit from the hard-won independence. Then only will its human resources be cultivated at the right speed. And then only will her natural resources be cultivated with an intensity which is necessary to maintain its teaming millions in a happy, healthy and enlightened condition ".

CHAPTER 3

THIRD LAW AND AESTHETICS

The Third Law is "Every book its reader". Its appeal to Social Bibliography is somewhat as follows: "According to the First Law, it is the soul (=thought-content) that is intended for consumption. It does not appeal to the senses. It has to appeal to the intellect. For this there must be curiosity. It is poor in many. Intellectual hunger does not occur at all in many. Therefore none but a few intellectuals will seek books voluntarily. Unlike hunger for food for body, hunger for food for mind is either absent or feeble and fleeting. It is not compelling. Books cannot find consumers without aid, as food can do. In the case of food, the majority of consumers seek it voluntarily. In the case of books only a few intellectuals do so. Even in the case of food, when the functioning of a person's gastronomic apparatus is dull, food is specially flavoured, coloured and dressed artistically so as to appeal even to senses other than taste. The functioning of the intellect in most people is dull at all times. Therefore make the body of the book attractive. Make it appeal to the senses. Make it appeal to the eye. Increase its aesthetic appeal. In response to the First Law, you have already made it convenient to handle. That was so far as its grosser, external dimensions were concerned. Make also the inside and the subtler physical features—that is type-arrangement—convenient to read."

The Third Law really depends on the principle that the probability of finding its reader for a book will increase with the number of people who will be attracted to it by the very aesthetic appearance of its exterior as well as its interior. It also wishes that the strain of reading should not be so severe as to make a reader throw the book away. It therefore seeks Social Bibliography to ensure that aesthetics and convenience of reading attract and retain readers. The aesthetics of a book and the convenience of reading concern :—

(1) the Jacket;
(2) the Binding;
(3) the Lay-Out of the Page; particularly the margins;
(4) the Space between Lines;
(5) the Length of Line; and
(6) the Type-face.

31 Jacket

It is the exterior of the book that first catches the eye of a potential reader. It should therefore be made as colourful and attractive as possible. Nature uses such an effective use of colour to attract insects which help in polination in the plant-kingdom and to attract the mate in the animal kingdom. We should imitate nature. When the book is taken on hand the "blurbs" should be fully appetising. The artistic skill which is dowered on the design of the jacket nowadays makes one sad that the jacket wears out so quickly. To avert the early dropping out of the jacket and to retain it permanently at the service of the Third Law, in recent years a transparent plastic cover is fixed over the jacket. The march of Social

Bibliography in regard to jackets is indeed a demonstration of what a purposeful alliance of art and science can achieve. It is easy to follow this march in detail. For no part of the book is as young in history as the jacket.

√311 HISTORY

Till some date early in the nineteenth century, books were issued in paper-covers or boards. It was left to the purchasers to have them bound to their taste. But the Second Law, democracy and industrial revolution brought about mass production of books and began to draw book buyers from classes who could not afford individual binding. To meet this situation books came to be bound in quantity and sold as finished products thereby reducing the cost of binding. Further, while still on the book seller's shelf a book is handled by many persons before it is sold. It soon became obvious that if the binding was to be fresh when the book is passed on to the purchaser, some kind of protection from spoiling was necessary. A temporary wrapper of some sort was the obvious answer. Paper suggested itself as the most convenient material. It was easy to cut a piece to cover the boards and spine and to turn it over the fore-edges—exactly as we used to cover our books with brown paper on the day we got our fresh text-books at the beginning of the year, when we were at school.

3111 Window-Wrapper

This first attempt at wrapping in this manner was offensive to the Third Law. For, it made the book an anonymous block. It had to be unwrapped and opened if its identity was to be known. To minimise this offence to the Third Law, a rectangular hole was made at the head of the spine to make the names of the author and of the book visible. The hole can also be replaced by celluloid windows.

3112 Printed Jacket

It was not long before it was realised that the simplest thing to do where large numbers of books had to be wrapped was to print the title on the wrapper. Once this freedom was taken, the Third Law egged Social Bibliography on to exploit this freedom more fully. Thr first mode of exploitation was to print a few extra words, as an inducement to the reluctant but potential readers, that the author's previous book had been received with rapture by the public and the critics or to praise the quality of the present one. It was but a natural next step to fill up the remaining space in the jacket with the names of other interesting books which the publisher had for sale or to describe some of them. It was not long before the jacket was seized upon for the play of all the cunning and skill of publicity. Artists are now employed to make designs for the jackets.

3113 Plastic Cover

The jacket soon reached the stage when the original purpose of being a protection against dirt was lost sight of. The jacket itself now needed protection against dirt when the customers browse round the book-seller's shelf. It is here that modern science has been invoked to protect a work of art which the jacket has become. During the last few years plastic chemistry has produced smooth, transparent, pleasant, plastic covers to protect the jackets permanently. There are now many brands available.

3114 A Blind Practice

When the genius of Social Bibliography under the stimulus of the Third Law had taken the jacket to this stage, the vandalism of some unthinking librarians has been to remove the jacket before placing the book on the shelf. This is due to the blind persistance of the tradition, but a few decades old, of throwing away the unprinted paper-wrapper when it was masking the attractive publishers, case. Another class of librarians show equal blindness in depriving the book of the self-advertisement which the jacket would give it and put the jacket on the display board. There is no doubt that there is some publicity value in this. If librarians want to have the best of both the worlds, the proper course is to ask the publisher to clothe the book with two copies of the jacket. Then one can be left on the book and the other transferred to the publicity board.

3115 The Next Stage

When I was in Paris in 1950, I happened to visit one of its libraries. That library violated the Laws of Library Science in several ways. Its location was on the top-floor which was the fourth or the fifth deck, and there was no lift. As I was ascending the steps I found several people bringing their books all wrapped in ugly brown paper, all made ananymous. I was puzzled. As I was being shown round the library, I found a stock of brown paper on the issue counter. On enquiry I learnt that no reader was lent a book unless he bought one of these brown paper sheets and wrapped the library-book. Poor readers whose intellectual hunger was a little more intensive than in others saved the brown paper bought for the first book and used it repeatedly for the later books until it was worn out. I thanked God and thanked the library that it did not collect the toll from this persistent class of poor reader on every occasion he borrowed a book from the library. The instinct of this French library to keep the exterior of the book clean and beautiful is quite in keeping with the sense of elegance with which the French genius is associated. But the practice of this library demonstrated the possibility that one can suffocate a child in the process of keeping it clean for aesthetic reasons. The Second and the Third Laws of Library Science make a joint appeal to Social Bibliography to make the provision of the plastic cover as much a part of the routine of book production as publishers binding. This I regard as the next stage expected in the Social Bibliography of jackets.

312 ANATOMY

3121 Material

Let us next take up the anatomy of the jacket. Its substance is paper. It should be substantial and yet not so stout that it cracks when folded. It should hold a fold easily and yet be tolerably stiff. It should not be so thin as to tear easily. The side of the paper that comes next to the book should not have a slippery surface. This will cause the jacket to slip. Avoidance of double-sided art paper is indicated. Otherwise the reader is irritated by the jacket slipping out while reading without the exhausting nuisance of holding the book tightly.

3122 Parts

The folded jacket has five surfaces—the spine, the front and the back which are on the outside and the two flaps by means of which the jacket is held on the book and which are therefore on the inside. The flaps should be adequate. They should extend at least to half the width of the board. The sheets for making jackets have therefore to be of a size larger than the sheets on which the book is printed.

313 ART

The colour of the jacket may be anything, single or varying according to the artists's skill. Artists have a scale of colours to match the skill of seriousness of the thought-content of the book. The texture of the paper also has often to be left to the requirements of the artists. Jacket-design is a work of art. What words should be used, what pictures and in what proportion—there can be no rigid standards for these. In a work of art, we can only ask for the end result. The details and the measures should be left to the intuition of the artist. Indeed we want an artist of great intuition to be employed on jacket-design.

3131 Lettering

The jacket may be printed by the relief process using the usual printing type or freedom can be given to the artist to provide his own lettering. Invention has given birth to some fine lettering. We have only to ask for legibility. Everything else we must leave to the artist.

3132 Psychology

The artist's creation and public taste have an inscrutable correlation between themselves. The psychology of design is best left to the artist himself. The best artist will bring out on the jacket the true soul of the book in such a way that it engages the attention of every potential reader. Intuition is self-born and spontaneous. Some years ago I was conducting what was called "reading habit competition" for school students. One of the conditions of competition was that the note-book in which the essay of the book was written should be provided with a cover which had a suitable design. I was amazed at the creative capacity of the young boys in making the cover design bring out the soul of their essay with an economy and an exactitude which are the true traits of all works of art.

3133 Duplication

The printing processes used for making copies of jackets are the same as those used in the printing of books. The majority are printed letterpress from type or blocks. Occasionally collotype is used. It is through the medium of planography, however, that some of the most interesting developments have taken place. Photo-lithography is often used. Auto-lithography will give even better results. These terms are explained in section 752.

314 SPINE

The jacket-spine must be designed in relation to the front board. It may have a picture or a pattern.

It may be so designed that the picture spreads from the board over the spine, provided the portions on the spine and the board are capable of being viewed separately without any sense of incompleteness. A vast problem has arisen since the Second World War began with regard to the printing on the spine. The spine of the books has become too narrow to admit for the words to run across it. They have to run up or to run down. This has given rise to the perennial controversy between "runners up" and "runners down". To make the words on the spine—the name of the author, the title, the call number and the name of the publisher—run parallel to the way in which they do if they are printed across the spine, we should support runners down. The opponents say that one naturally bends his head to read the backs of spines in thin books and he begins with the bottom. But this is true only for those who bend their heads on the left. It should be equally easy for readers to acquire the habit of bending their heads on the right in which case they will read from the top to the bottom of the spine.

A spine of normal thickness usually carries a short title within one inch from the top, the name of of the author below it, and the publisher's device or name near the bottom. In case prenatal classification is done, the call number will have to be above the publisher's device.

315 THE FRONT

The front of the jacket usually contains the title and the name of the author and the publisher's imprint. As already stated in section 3132, it contains a decoration or an illustration calculated to enhance the book's appeal and suggest its contents. It may also contain a telling advertisement of the book itself or an appetising account of the author's authority in the subject of the book.

316 THE BACK

Generally the back of the jacket is used for the advertisement of other books in the publisher's stock —particularly those in the same subject or related ones. Thus a volume on Library Classification may have on the back of the jacket a list of other books on Library Science. As an alternative, this side of the jacket is used for a list of the other books by the same author with or without annotation. It is offensive to let the back of the jacket for advertisement on totally unconnected matter like Mysore soap or India coffee.

317 FRONT FLAP

The front flap is usually utilised for "selling" the book. Either a preview or a review or a special right-up on the value of the book is usually printed upto three-fourths of the way down. The price of the book is printed at the foot.

318 BACK FLAP

Either the matter in the front flap is carried forward to the back flap, or it is used to print a short account of the author so as to enhance the authoritativeness of the book.

32 Binding

When one comes across a new book, one invariably opens out the jacket and examines the binding. This discloses a good opportunity for Social Bibliography to exploit in favour of the Third Law. In fact the Third Law would like to have the binding as attractive as possible. Here comes a conflict between durability and strength on the one hand and artistic appeal on the other. An account of durable, strong, re-inforced, library binding is given in Chapter 8. It will have to be done by hand. It cannot be made on a mass scale. Its cost will therefore be high. To make it artistic would mean increasing the cost still more. This kind of individual binding provided for each copy would take the book beyond the financial capacity of most readers and even libraries. It has therefore become the practice to provide a cheaper and less strong binding but with good artistic effect. To make it cheap it has to be machine made. A machine made binding of this kind usually involves the preparation of the cover quite independently of the book. Such a cover is called Publisher's Case.

321 History

If the jacket is the youngest part of the physical book, binding is the oldest. Binding—attractive binding—had come into vogue long before printing was invented. The binding of some of the medieval manuscripts is magnificent. The rich lavished their wealth in decorating the binding of their manuscripts in the most gorgeous and costly manner. Excellent leather was used as covering material. It was inlaid with silver or gold and set with jewels. The artists, jewellers and goldsmiths worked together on the binding. In the incunabula period the tradition of manuscript binding was continued. However, as the number of books was increased by the invention of printing, the munificence lavished on binding a single copy had to be spread over several copies. In those days the basic material for the cover was wood or card board. The covering material was leather, silk or velvet and the tooling material was gold. Sometimes the wooden boards were not covered. They were polished to reveal the decorative qualities of the natural grain, or they were inlaid with gold or silver, or carved in low relief or intaglio. Each book was bound separately. Each tool was impressed separately on the covering material. Each impression was gilded individually. It was a slow process. It took sometimes weeks and months to bind a book. There was no doubt that such a gorgeous binding was very attractive. Perhaps it was too attractive. It was so attractive that people began to own books for the sheer richness of the binding rather than of the thought-content, for the enjoyment of the exterior rather than the interior. As the number of books increased further and further, the embellishments began to decrease more and more.

3211 Present Day

As stated in section 311, the tradition for good binding and the need for cheap binding was reconciled by leaving binding to the individual owner and the publisher himself issuing the book in paper covers or boards. But the industrial revolution of the early nineteenth century made mass-production popular. Mass-binding was attempted. The machine usurped the field. Cloth was used. Cloth as a covering material lent itself to be "blocked" in one piece. The machine and the "blocking" dispensed at one stroke with the days and weeks that had to be spent formerly on each book. At first the blocking was done with lavish gold. Urge for cheapness often replaced gold blocks by plain blocks. At first the all-over blocking of cloth served the incidental purpose of covering the unpleasant cloth surface. But in due course colourful cloth was designed. Cloth came to be had in dozens of different kinds and qualities and in as many surfaces and colours. The machine made it necessary to prepare the cover independently. While this gave opportunity to make the cover really attractive, the attachment of the book to the cover had to be weak. The binding with which the publisher releases the book nowadays is called "Publisher's Case" or simply "Casing".

322 ANATOMY

The publisher's case consists of the board and the covering material. It is usually straw-board and cloth that are used. Choice of cloth is a matter of taste. Sometimes each publisher prefers a particular colour and sticks to it. The colour of the covering material used by the Cambridge University Press is different from that of the colour used by the Oxford University Press. In texture too they differ similarly. There is also a conventional correlation between the colour of the cloth and the nature of the thought-content in the book. Very attractive plastic coated cloth is coming into vogue. The Third Law would ask for an inviting colour and a pleasant surface in the covering material used.

323 ART

It is true that a cloth-bound book is not blocked quite as luxuriantly or as elaborately as the leather bound books. The appeal of simplicity is not however less powerful than that of gorgeousness. The majority of modern books bear nothing more than the names of the author of the book and the publisher. Still the harmony of such virtual bareness can be made sufficiently attractive and dignified.

324 SPINE

In the days of binding by hand the cards on which the sheets were sewn, showed themselves as raised bands on the covering material on the spine. In machine-binding the cover of the spine does not touch it. There can therefore be no raised bands. However the traditional desire for them is satisfied by parallel block rules in approximately the position where the bands would have appeared. The panels formed by these rules were once decorated very elaborately. It is now felt that the Third Law would be better satisfied if the panels are made functional. The uppermost panel takes the names of the book and the author. Thr lowermost panel takes the name of the publisher. The upper one is usually larger than the lower one. Sometimes recommended books like those of the National Book Club put on a separately made panel. It is usually made of leather with a distinctive colour and glued on to the binding. This is one of the ways in which Social Bibliography propitiates the Third Law.

325 THE FRONT AND THE BACK

Nowadays the front and the back of the binding is left empty. This is rational. The books are usually displayed in shelves arranged closely packed. In this situation the front and the back are not visible. It is only the spine that is visible. Therefore it is but proper that all attention should be diverted to the spine and that the front and the back should be left empty. Another factor that is responsible for it is the advent of the jacket. When the front cover is displayed, it is the jacket that is on view and not the front of the cover.

326 THE BOARDS

Though the boards are covered and are not visible, they do play some part in the aesthetics of the book. The boards contribute a great deal towards the satisfaction of the sense of touch. Their weight and hardness do matter. Children's books can be made very attractive with very thick boards as the core and coloured paper as covering material, printed over artistically.

327 EDGES

The treatment of the edges of the pages can add to the dignity and attractiveness of the binding of the book. A clean, smooth edge on all the three sides is now becoming common. This treatment is always necessary to the top edge as dust is apt to settle on it. Before the war, the top-edge was sometimes gilded. As gold does not absorb dust, it is easier to keep such an edge clean; but more than that the aesthetic advantage was the pre-potent one. The *Bible* is sometimes gilded on all the three edges in order to give it an air of richness and distinction. Where gold is too costly, the top edges are washed in some suitable colour.

33 Lay-Out of the Page

The jacket attracts the reader. The binding makes the feel of the book pleasant. This is all what happens before the book is opened. The Third Law would like that Social Bibliography should call aesthetics to help even after the book is opened. The lay-out of the page also should contribute to the aesthetics of the book. The shape and the size of the page can make or mar the attractiveness of a book. The crown quarto which is 10″ × 7½″ appears to be the most attractive shape and size. This question of shape and size has been already dealt with in the first chapter.

331 MARGIN

The type-matter differs in colour-tone from the surrounding paper; and the type matter should be set on the background of paper in the same manner as setting a photograph in a mount. One does not feel happy to see a large photograph mounted with narrow margins all round; nor does one like to have the photograph centred on the mount. The same thing applies to a printed page. Firstly, the shape of the printed matter should harmonize with the shape of the page, and more or less in the same proportion, though not necessarily exactly so. The margins all round should be ample in the case of large sizes such as quartos, and in like proportion in the case of octavos. In all cases there should be enough to allow the type matter to stand out in a pleasing manner against the white paper as a background. Secondly, these margins should not be equal all round, nor even should the margins on either side along the width or at the top and bottom along the depth be equal. This rule is not often observed, with the result that the printed page is most unpleasing to the eye. It is not sufficiently well realized that the margins form one of the most important factors that go to beautify print. A page crowded with type is like a room filled with furniture. Furniture can be a source of great beauty to the room, provided the pieces are chosen tastefully and arranged neatly, and if their size and number are made to suit the size of the room. Space is an integral part of the design, and should be given its due place in any artistic arrangement. Having got the necessary margins, they should be arranged unequally all round. Printers call the four sides surrounding the type-matter thus, the side close to the stitching as the back, the top part as the head, the outside of the page away from the stitching as the fore-edge, and the bottom of the book as the tail.

332 PROPORTION OF MARGINS

The margins should be so allocated that there is least in the back, more at the head, still more at the fore-edge, and the most at the tail. The proportion in which these are allocated, is a matter on which all are not agreed. Tastes differ considerably in this respect. Some of the proportions commonly advocated are, in the order of back, head, fore-edge and tail, as follows: (a) 4 :4 :6 :7; (b) 4 :5 :6 :8; and (c) 4 :5 :6 :10. The famous artist, poet and printer, William Morris, used for some of the famous books printed by him at the Kelmscott Press, rather narrow back and head, fairly broad fore-edge, and a very considerable tail margin. Between this extreme and the modest margins in which the margins are but 1/6 in. more progressively as one proceeds from the back to the tail, there is room for considerable freedom to choose the extent of the margins and the proportion in which they are arranged, to suit different tastes.

34 Space Between Lines

William Morris preferred to have lines following each other closely with little or no space between successive lines. This is "solid" setting. But in this, he had few supporters even in his time. Though every one acknowledges Morris as the greatest modern aesthete of printed books, one finds it impossible to share his liking for lines closely packed together. The general feeling in this matter is that the lines should be spaced whenever the margins are large—and the longer the margins, the greater the space between lines; but it should not ordinarily exceed 1/18-in.; 1/36-in., however, is the most pleasing for a large octavo or crown quarto. Too much line-spacing will produce a certain lack of cohesiveness, which is as unpleasing, if not more so, as lines set solid. Also, the larger the type used, the greater the space required between the lines. The space between lines is usually secured by the insertion of leads. Nowadays types are produced in which the body is 1/72″ bigger than the type face itself. Many monotype faces are of this kind. No lead is necessary in their case. The spacing is automatic and very pleasing to the eye.

35 Length of the Line

The length of the line is another element which can either retain a reader or repel him. In the old palm-leaf books of India, the lines were often 18″ to 24″ long. A reader often fumbled in passing on from the end of one line to the beginning of the next. This was most irritating. The optimum length of the line is determined by the size of the type. The larger the type, the longer can be the line. For 12 point type 4″ may be tolerable. For 8 point type anything more than 3″ will be inconvenient. For 6 point types, which are used in reference books, 2″ should be the maximum. These considerations will determine the number of columns which a page should have in order that a printed page may satisfy the Third Law from the angle of aesthetics as well as convenience. What can be taken in one sweep of the eye is the most convenient length for lines.

36 Type Face

In the aesthetics of the printed page, the type face plays a prepotent part. The potency of its part is as great as the part of the human face. In the aesthetics of human personality, the character of a man is shown by face. So also the "character" of a type face determines the aesthetic effect of the printed page. The character of the human face is elusive, indescribable and intangible. All sense its general effect. But few perceive the infinity of elements which go to produce that effect. So it is with type face. Hardly any reader may be able to distinguish one type face from another when a single type is seens. But when the types are strung together into lines and arranged in a page, the reaction of most readers is imminent and often alike. The Third Law would therefore ask Social Bibliography to pay as much attention to this basic factor of type face as to any other. Indeed all the other factors centre round type face. Though the character of a type face is unanalysable, it is helpful to recognise three characteristics of it :—Design, weight and style. "Design" concerns the shape of the letter and the inter-relation of every part of it. By "weight" is meant the boldness of the impression produced by the type. There is a whole spectrum of weight from "white" to "black". Style is the term concerned with the distinguishing, for example, between capital and small capital, and ordinary and italics. The design of the type face is a work of art. It can be as varied as the artists themselves. The weight has got a limited range to play with. So it is with style. It is irritating if different designs of type face are mixed in the same book. But the aesthetic effect can be enhanced by a proper and economic admixture of different weights and styles. The aesthetic effect of this mixing up can also be made functional. It can be made to underline certain words or sentences in order to bring it to the special attention of readers. It is also usual to mix up different type-sizes in the same face to mark out certain portions which may be skipped over in first reading, or may have to be picked up readily in a later reading.

361 HISTORY

The type face is similar to human face in other ways too. We say that all men had descended from the same ancestors—Adam and Eve, as the Bible puts it—and yet no two faces are alike. So also it is true, though not to the same extent, that all type faces have descended from the same ancesters although they all differ from one another. The original ancestor was the written letter of pre-printing days. When Gutenberg cut his first punches, he faithfully copied the written letter of his day. It was of the ornamental Gothic variety. The hurdles which the Gothic face carries with it did not stand in the way of the select intellectuals who alone were illiterate and whose attraction to a book depended on their attraction to the thought-content and did not lean, for its continuance, on the aesthetics of the printed word. But as the Second Law began to draw readers from increasingly lower intellectual strata, the Third Law naturally wanted that the type face should be without any hurdles whatever. It egged Social Bibliography on towards a plain but inviting kind of type face which will retain the custom of every reader without inducing undue strain in poring through dozens of printed lines. The social pressure of the Second and the Third Laws has been ever active. Many type faces came to be designed decade after decade. And now that universal literacy is extending the potential region of readers even to the lowest intellectual levels, new type faces are being designed almost every year. This has become literally true in our own days. Here is an illustrative chronological table of type faces.

Year of Design	*Name of the Design*	*Country of Design*
1470	Cloister	Italy
1530	Garamond	France
1722	Caslon	Great Britain
1757	Baskerville	Great Britain
1789	Bodoni	Italy
1810	Scotch	Great Britain
	Walbaum	Germany
1852	Bookman	Great Britain
1900	Century Expanded	(Children's books)
1911	Kennerley	America
1912	Madieval	Holland
1916	Goudy	America
1931	Baton (more for display)	Germany
1932	Weiss	Germany
	Perpetua	America
1934	Deepdene	America
1935	Electra	America
1936	Egmont	Holland

1937	Electra	America
1938	Stradivarius	Hungary
1939	Caladonia	America
1941	Fairfield	America
1942	Waverly	America
1942	Cornell	America
1946	Studio	Holland
1952	De Roos	Holland

362 ANATOMY

The structural elements in the form of letter which go to decide its " character " are various. Some of them are Serif, Hook, Loop, Ascender, Descender, Cross Strike, Hair-Line, Curve etc. The grace of letter is determined not only by the grace of such constituent structural elements but with even more emphasis by the way in which their variants are combined to form the letter.

363 ART

It will take us beyond the province of Social Bibliography and of Library Science if we go into further details. The creation of a letter is a matter of art. Geometry of shape and structure can only help us to appreciate the way in which these have been handled by the artist to produce the total effect on the reader. A knowledge of these elements will be of help in designing experiments to study the effect of type-face on men of the lower quartiles, who have to be attracted and retained as habitual readers. For it is the librarian who has unusual opportunities to observe and report to the type-design artists. He should observe and report intelligently. This defines the role of the library profession in Physical Bibliography. His role is an important one in Social Bibliography.

364 PAPER

Whatever be the absolute character of the type face, it is the character of the impression that makes on paper that has true value to the Third Law—that produces the ultimate artistic effect. The texture of paper has a decided effect on the print of the type face. Soft papers have a tendency to " thicken ". That is to say they make them appear as bolder faces when compared to the same characters printed on smooth hard paper. The following is a table showing the graduation of the effect of paper on the impression of the type face—of course within its own narrow limits.

Paper Surface	*Degree of Boldness*
Newsprint	Boldest effect
Antique	Next boldest
Super-calendared	Light
Coated	Lightest

When seen on a whole page the varying weight of the same type printed on various types of paper is indeed easily recognisable.

365 INK

Ink also may make some slight modification in the character of the impression of the type face. It should have sufficient tack to withstand the impression without being subject to undue lateral displacement as a result of the applied pressure if the true character of the type face is not to be altered.

It is also necessary that the ink must not chemically react with the printing surface. In fact the resulting character of the impression is determined jointly by the character of the type face, the nature of the paper on which it is printed and the nature of the ink with which it is printed.

37 India

India has yet to look upon the physical book as a work of art. It has not yet learnt that the Social Bibliography of a book will be to the satisfaction of the Third Law only if the artist is invited to play his part. He will have to play his part in the design of the jacket, the binding, the title page, the overall printed page and the type face. The value of a work of art cannot be measured in physical terms. It is something ethereal. It is not measurable as materials. An artist's skill cannot be bought by length or weight. Unfortunately India has not yet recovered from the stage of fixing the value of the physical book by size and weight quite oblivious of the aesthetics of the type-face used, the printed page produced or of the external finish of the book. This retardation in the scale of values is proving to be inimical to the progress of the Second and the Third Laws. So long as an alien government held India in its grip, there was no attempt to help the advance of the Second and the Third Laws in the country. It was only 10% of the people that could read a book. These were all drawn naturally from the first intellectual quartile. As we had observed in the first section of this chapter, no hurdle was insuperable for such people. There was therefore no incentive to pay attention to the aesthetics of book production. Now that India has become independent, and what is more it has adopted the most democratic form of constitution possible, the State is hampered at every turn by the absence in the masses of the capacity to inform themselves, educate themselves and inspire themselves with the aid of the printed word. Every enterprise—be it transport or industry or administration—has to depend for its success on the information and enlightenment which the workers in the lowest rung can pick up for themselves. During the last five years, we have been experiencing the pestering, frustrating and heart-breaking phenomenon of several enterprises being started with fanfares and soon fizzling out to a level that everybody concerned is ashamed to speak about it or even to remember it. In the modern set-up no method of making the lower quartiles put forth their best efforts and participative and intelligent co-operation, can escape the feeding of the intellect of the workers with printed words.

371 COST

Recently there was occasion to discuss at the national level the production of Social Education Literature. The moment the aesthetic qualities necessary to attract and retain the neo-literate's interest in books was mentioned, there came forward the prompt monetorial voice of finance, " You are talking of the ideal. How can our poor people afford the cost of such a luxuriously produced books ? " This is a symptom of the deplorable sense of values, which now prevails in the country at most levels. The proper approach should be, not to take the vote of the treasury bench as the first step. Unfortunately it is this wrong course that is adopted in almost every project in the country today. The proper course is something else. The first step should be to decide what the ultimate objective of a project is. The second step is to decide in how many years the ultimate objective could be achieved. The third step is to work out the time-table for the development of the project. The fourth step is that of prognosing the possible dangers and risks which the project is likely to be exposed to and to provide for their prevention. The fifth step is to decide what are the necessary and sufficient means to realise the objective of the project within the prescribed time-table and to get round all possible dangers. It is only in the sixth step of financing the project, that the treasury bench should be brought in for consultation. Of course it is taken to be a *Dharma* of the treasury bench to present to any organising body the copy book maxim " Finance won't allow it." The seventh step arises the moment finance has taken the stereotyped attitude.

372 STATESMANSHIP

It is here that statesmanship comes into play. It is for statesmanship to find out methods of maximal efficiency. Maximal efficiency can be secured in diverse ways. It is best secured for all the problems of the day viewed as a whole, evaluated globally, and developed integrally.

373 MASS PRODUCTION

In several projects and particularly in the project for Social Education Literature mass production is one of the methods which statesmanship should adopt. In mass production the irreducable over-head cost is distributed thinly over a vast area of consumption. In India today books of the order of Social Education Literature are wanted in hundreds of thousands of copies. This want is potential. It is the duty of the statesman to make this actual. If he does it, books for the adults can be produced in a quantity which will simultaneously admit of the highest possible aesthetic standard and the lowest possible cost.

374 WRONG ROLE

The government in our country today is not sure of what role it should play for maximal efficiency in the development of the country. It is not able to make up its mind whether it should play the role of the capitalist or the entrepreneur. It attempts everything by itself. It plays thereby into the hands of a bureaucracy the rigidity of whose outlook is proverbial. The successive failures of many of our ambitious and well meant projects during the last five years are traceable to this wrong role which the government tries to play. The government, for example—amazingly enough even the Central Government of Federated India—begins to run schools directly. It seeks to write books through its officers whose daily life is spent in the routine of unwinding red-tape. It wants to spot out the best authorial capacity in the country through committees composed largely of bureaucrats and politicians. It even hopes to play the role of a publisher, printer and distributor. All this is wrong.

375 RIGHT ROLE

The right role of the government is to take a whole view of book production, to establish the objective that should be realised, and to develop facilities for it to be realised. Its chief role should be to plan and to facilitate the working of the plan so as to secure maximal efficiency. It should pool together the authorial, the publishing, the paper making, the printing, the binding and the library personnel of the country and enable each party to understand its own role in relation to the roles of the others. Actual execution, it should leave to the appropriate parties. The most difficult part is to bring to the surface the really competent artists with vision both for creating the soul and the subtle body of the book—the thought-content and the language of the book—and to create the physical body of the book. It is a business for entrepreneurs in the publishing trade. They should be entrusted with this task. The production of the right paper, the right type face, the right printed page and the right cover and jacket should be left to the care of the concerned sub-group in that trade.

376 FINANCIAL BACKING

The great headway which Social Bibliography has to make in the country will be brought within what is practicable only if the State organisations find market for the books. As we have already stated, unless this market is vast, correct standard of book production would become impossible. The State should provide, during the first twenty or thirty years, for the bulk purchase of books of proper standard by the various social education authorities. This it should do without making it a ritual which kills at once the initiative of the supplier as well as the consumer.

38 Message of Social Bibliography

The book has now taken an important place in modern community. Communication is of the very essence of community life—be it a small local one or a big national one or the vast community of the whole world. It is co-operative living alone that can bring concordance and happiness. Co-operative living will be impossible without communication. There are three modes of communication—communication in the immediate presence of one another, communication of the voice alone *i.e.*, communication through radio, and communication through writing *i.e.*, through books. Of these three modes, the first is the most effective. For, in that case not only the words, but also the movement of the eye-balls, the modulation of voice, the change of expression, the gestures, in fact, the total personality is pressed into service to effect communication. This global mode of communication was available only when the community was a small local one. When its size increased to that of a nation occupying a vast territory, this form of efficient communication ceased to be available. A great personality like Mahatma Gandhi might move round the country and communicate through the whole charm of his personality once in a while. This personal mode of communication can only act as an appetiser. It can only stimulate a way of looking at things. It can only lift people to a new level of life. But to maintain that view and to continue in that level, it is necessary to be fed continuously by other means of communication. Communication by radio no doubt obstructs the voice of the personality and produces a valuable tone-effect in the communication. But the voice on the air is ephemeral. It dies out. This again can only appetise and stimulate. It is not a form of communication to which a person can come back again and again for checking up, or for absorbing more of it in the measure of his own advancement. The importance of the written book as a means of communication lies in supplementing the above two forms of communication. But the written book, as it has been already stated at the beginning of this chapter, is the thought transformed first into phonetic symbols—which are an abstraction—and again the transformation of these phonetic symbols into a physical something—the book.

381 HARMONY

This physical something must be made acceptable to the common man. For this, every part of it must be made handsome. All the features of the book—from the intangible thought to the most external jacket—should be blended into a balanced whole. It is the thought of the author and his style which form the starting point. This creates the atmosphere of the book. These fix its character. Every element in its physical clothing should be in keeping with this character. The choice of type-face, the design of the page, the binding and the jacket should all express and enhance the character of the book. The author and his printer are collaborators. The business of the printer is to present the author's thought as attractively as possible, to captivate the reader by the very appearance of the book and when he picks it up to make his reading easy, irresistible and delightful. This is the message of Subject Bibliography formulated by the Third Law.

CHAPTER 4

FOURTH LAW AND LAY-OUT

The Fourth Law is " Save the time of the reader ". It is not only the objective time but also the subjective time that should be saved. Saving the subjective time is equivalent to saving the tempo of the reader. To save the tempo of the reader it is not sufficient if all the physical characteristics of a book and its aesthetics are to the satisfaction of Social Bibliography. It is also necessary that the book should have built into it and on it several auxiliaries. These concern the thought-content of the book more intimately than what we have considered so far. These are matters like giving a title to the book, tooling the title on the spine of the binding, providing a title page, a contents page, a conspectus or an introduction, dividing the book into chapters and parts and making them stand out distinctively, giving helpful head lines to pages and providing an index. Of these the title page, the contents page, the conspectus and a few other pages like half-title page and the dedication page are usually prefixed to the text of the book. They are therefore known as " Preliminary Pages " or " Preliminaries " or " Prels ". It is usual to print the index at the end of the book. The index and other matters like appendices, annexures, glossaries and bibliographies which are added after the text are usually known as " End Matter ". A generic name for the prels and the end matter, which are separated by the text, is "Oddments". Of the oddments, prels are calculated to save the time of the reader as he approaches a book before he dives into it. The end matter is calculated to save the time of the reader when he comes back to the book on a second or later occasion to verify a statement, or to look up a fact, or to check his memory, or to pick out some specific information. Thus the oddments and the other matters mentioned in this section are the creation of Social Bibliography in its attempt to satisfy the Fourth Law.

41 Aids to Eye

In the early ages of writing, words and sentences had to be reconstructed by following the thought. They were not properly separated out so as to help the eye to recognise them at sight. It was not unusual to make the entire matter in a manuscript to run on as a single chain of letters without separation of words or of phrases, clauses and sentences by punctuation marks, or separation into paragraphs, or separation into chapters or into parts, and without paragraph headings or page headings; and without index. A most fantastic example of a book was brought to my notice a few months ago by Pandit Yellappa Shastri, a Jain scholar of Bangalore. He said that the manuscript was in his possession. The script was in Kanarese. But it was really polyglot. By varying the order of the letters in different prescribed ways, one gets out of it different books in different languages. Again by following certain other prescriptions in combining the letters, one gets different books on different subjects. Say, for example, if the second letters of each line were taken together, it was in Sanskrit. If the third letters were taken together, it was in Tamil. If every fifth letter is read out, we get astronomy. If every twelfth letter is read out, we get medicine, and so on. A more tantalizing effect is that even the lines had not been marked out. The owner of the manuscript said that after several years of struggle he had been able to mark out the lines and that he also obtained some clue regarding the combination of letters which gave certain languages and certain subjects. He said that he also found instructions to arrange the letters in geometrical patterns or in the form of the figure of a bird, a snake, an elephant and so on. When the letters were thrown into such prescribed patterns, an account of certain subjects symbolised by the patterns was got. Surely such a disposition of the letters in a printed book will be repugnant to all the Laws of Library Science and particularly to the Fourth Law.

411 SPACING

It is not known when space came to be left between letters. Perhaps punctuation marks were inserted even later. Separation into paragraphs should have been still later. Chapter divisions are said to have been developed in the printed books by the end of the sixteenth century, although it had not become the rule. We have now got a more or less universal convention about different kinds of space—word space, comma space, semicolon space and full stop space. It has also become a universal practice to begin each paragraph in a new line and to indent it by a few ems. Another common practice is not to begin a chapter at the top of the page. It is usually started some lines lower down. The chapter heading is said to be "dropped". The space between the top of a page and the first line of a chapter is called "chapter drop". The practice of writing the first letter of a chapter in a huge hand and illuminating it in manuscript books was continued after printing was invented. It is even now being continued by some printers though the size has been reduced considerably.

412 HEADING

The latest practice in printing books admits headings of various kinds—chapter heading, page heading and section heading. These headings are a great help in browsing through a book. All these headings are normally centred across the measure of the page. It has now become a general practice to indicate the status of these headings by suitable variations in type face. One such variation is as follows :—

1 Small caps for page heading.
2 All caps for the first line of chapter heading which mentions the number of the chapter.
3 Bold face caps for the name of the chapter.
4 Bold face cap and lower case for the headings of sections.

5 Cap and small caps for headings of sub-sections.

6 Cap and lower case for headings of sub-sections of the next order.

7 Cap and lower case italics for sub-sections of still higher order and so on.

413 PAGE HEADING

A simple and helpful rule for page heading is: "Use the short title of the book as the heading for every verso page and the heading of the chapter as the heading for each recto page." It is the practice of some authors and publishers to use for the heading of each page a few words which bring out the focal thought developed in the page. This requires great judgment on the part of the author. It is my feeling that the benefit which it gives to the reader does not justify the trouble of constructing such page headings and the delay in printing caused by their construction.

414 CHAPTER HEADING

Some books merely number the chapters. Some give fanciful chapter headings. The Fourth Law will be better served if the chapter heading is an expressive one. The expressiveness may be direct or oblique. In informative books, particularly the directly expressive chapter heading is helpful. The coining of oblique but suggestive headings is a work of art.

415 SECTION HEADINGS

Few books give section headings even today. These have been slow in evolving. In my books

I had been giving section headings, almost to the point of every paragraph getting a heading of its own. Those headings, if at all they are given, should be expressive ones. My practice has also been to number these section headings and sub-section headings by a decimal notation, which brings out the modulation of every chain of headings and sub-headings. I go even a step further and make the numbers mnemonic. I found this extremely helpful even in developing the theme of the book. A few other authors too use such a system of notation. Some of the mathematical books published by the Cambridge University Press number their headings in this manner. Some of Otto Jesperson's works on linguistics also follow this practice. As this is new, the usual resistance to anything new is met with. It took me some effort to pursuade one of my publishers to provide such a profusion of section headings and much against their wish to accept also my numbering of sections. My belief is that this practice will add considerably to eliminate fogginess in thinking on the part of authors and to help the readers themselves to maintain a good tempo while first glancing through the book. It will be of help in the second slower reading and assimilation. It will also help readers when they turn to the book again for consultation. This of course is a practice which implies considerable abstraction. I do not expect that the value of this will be easily appreciated. But I feel sure that if publishers and authors bring this into practice, the reading public will get accustomed to it and ultimately have the benefit of it. This is a direction in which Fourth Law would like Subject Bibliography to develop.

416 SPINE

To save the time of the reader in spotting out his book from among a large collection arranged in numerous shelves in a library or even from out of a small collection, the Fourth Law had long ago succeeded in urging Social Bibliography to have the name of the book and the name of the author brightly tooled near the top of the spine. In recent years libraries have begun to tool the call number of the book at a uniform height of one inch from the bottom of the spine. Since books are arranged in an open access library by call numbers, this practice has become almost a necessity to satisfy the Fourth Law. I have been advocating that Social Bibliography should work for what I have called pre-natal classification and that every copy of a book should have the call number tooled on its spine before it is released by the publisher. I have been doing so with my books. I find that some publishers in India as well as in other countries are beginning to appreciate the service of this practice to the Fourth Law. Of course it has become a little more common to put the call number on the back of the title page. It requires only a slight stretch of imagination or rationalisation to have the number tooled on the spine also.

42 Evolution of Prels

Oddments are later additions to books. Early books did not have them. Among oddments, it is the preliminary pages that evolved first. It may be interesting to trace the various stages through which they have passed in their evolution.

421 PRE-NATAL STAGE

Perhaps it may be well to begin even by referring to what may be called the pre-natal stage of the title-page. To get an idea of it we should examine the ancestor of the book itself, in other words the manuscript book.

It is a matter of common knowledge that the printed books of the incunabula class closely imitated the manuscripts in the form to which they had evolved at the time of Gutenberg. These manuscripts did not possess a title-page—still less preliminary pages. Some of the barest of information we are now accustomed to look for in a title-page and the neighbouring pages was given at the end of the manuscript. Indeed the portion giving this information had a special name of its own, *viz.*, Colophon. In fact ' colophon ' is defined in the *New English dictionary* as " The inscription or device, sometimes pictorial or emblematic, formerly placed at the end of a book or manuscript, and containing the title, the scribe's or printer's name, date and place of printing, etc.....In early times the colophon gave information now given on the title-page."

For instance, Jacob de Voraigne's *Golden legend* printed by William Caxton has the undermentioned colophon. The book contains 448 leaves with head lines and foliation. The matter is printed in two columns in each page, each column being made up of 55 lines. The colophon reads:

> 1 *blank.* 2ᵃ [*wood cut*] 448ᵇ. *Col.* 2: Thus endeth the legende named/in lateyn legenda aurea/that is to saye/in englysshe the golden legende/For/lyke as golde passeth in valewe alle/other metals/so thys legende excedeth/alle other books/wherein bencontey=/ned alle the hygh and grete festys of/our lord/the festys of/our blessyd la/dy the lyues passyons and myracles/of many other sayntes/and other hys/toryes and actes/as al alonge here/afore is made mencyon/whyche werke/I haue accomplished at the commau=/demente and requeste of the noble and/puyssaunte erle/and my specyal good/lord wyllyam erle of arondel [and] haue/fynysshed it at westmestre the twenty/day of nouember/the yere of our lord/M/CCCC/lxxxiij/and/the fyrst yere/of the reygne of kyng Rychard the/thryd ////By me Wylyam Caxton

This is what we have referred to as the pre-natal stage of the title-page and the preliminary pages. For under the imitative influence of the manuscripts some of the earliest printed books did thus give a fully worked out colophon featured prominently and resisting the appearance of the title-page which would throw its importance to the shade.

422 INCIPIENT STATE

After labouring in this pre-natal stage for about a quarter of a century, the title-page in the front had its small beginning. It was indeed as puny as a new-born. Though a separate page was devoted to it, it was rendered similar to the half title-page of our days. It did not however remain long in this puny form. For, even the third quarter of the fifteenth century witnessed the printing of a book which had the title-page expanded to a more respectable dimension, almost suggestive of the modern title-page.

423 NEW BORN

In 1470, Arnold Hoernen at Colougne printed a long paragraph, on an otherwise blank page, giving the title of the book *Sermo ad populum predicabilus in festo presentacionis Beatissime Marin; Semper Virginis.* Besides such a long title, the title-page contained also some eulogistic remarks regarding the book. The year of publication was also given. As a matter of fact, this book is said to be unique in respect of transferring bodily the information contained in the colophon to a page at the beginning of the book.

Another improvement was made in the display of the legends in the title-page in the Italian edition of the *Calendar* of Regimontanus printed in 1476 by Erhardt Ratdolt. Here the title-page was elaborated further by the insertion of the imprint near its tail margin. Thus, even in the early sixteenth century we have the prototype of the modern title-page. But these were isolated examples. It was only about the middle of the sixteenth century that the practice came virtually into universal vogue.

424 GODFATHER

In those days it was the printer rather than the author that was the godfather of the title-page. This led naturally to the dominance of his interests in the legends that were allowed to appear in it and the way in which they were rendered. For instance, the title appended to an edition of the life of Sir Philip Sidney by Sir Fulke Greville published in 1652 may be cited. The following is a transcript of the title-page in question:

> The life/of the Renowned/Sr Philip Sidney with/ The true Interest of *England*/as it then stood in relation to all For-/rain Princes: And particularly for sup/pressing the power of Spain Stated by Him./ His principall Actions, Counsel,/Designes, and Death./ Together with a short Account of/the Maximes and Policies used by Queen/*Elizabeth*, in her Government./ Written by Sir Fulke Grevil Knight, Lord Brook, a servant to Queen/*Elizabeth*, and his companion and friend./ London, printed for *Henry Seile* over/against st./Dunstants Church in Fleet Street./ MDCLII.

It is observed by an editor of a later edition of this work that it was first published in 1652, twenty-four years after its author's death and the title 'The life of the renowned Sir Philip Sydney' (with other matters) was given to it presumably by the unknown P.B., the editor, certainly not by Greville himself. In a manuscript copy of the work the title is simply 'a Dedication'.

Here is the opinion of an Elizabethan critic on the matter of godfathership of the titles which corroborates the above statement. The critic says that "On the title-pages of the old editions of the separate plays designations are used which appear to have been chosen at random by someone other than the author."

These statements lead us to guess that the title-page was the creation of the publisher or someone else connected with the book and not of the author. Taking advantage of this fact the publishers tried to make use of the title-page for advertisement. As a natural consequence of this, much of the contents of the book began to appear on the title-page itself. Here are a transcript of the title-page of such a work and that of the title-page and the contents pages of the same work printed at a later date:

> The/Rare and most wonderful/thinges which Edward Webbe/an Englishman borne, hath seene and passed/ in his troublesome trauailes, in the citties of Jeru-/salem, Dammasko, Bethelem and Galely:/ and in the Landes of Jewrie, Egipt, Grecia,/ Russia, and in the land of Prestor John,/ Wherein is set foorth his extreame flauerie sust/ained many years together, in the Gallies and wars/of the Great Turk against the Landes of Persia,/Tartaria, Spaine, and Portugall, with the/manner of his releasement and comming/into Englande in May last./ London,/ printed by Ralph Bolwer for Thomas Passier, and/ are to be solde at his shop in Cornhill, at the signe of the Cat and/Parrats over against Popeshead alley, near the Royal Exchange.

This is the title page of the work printed in 1590. Here is the transcript of the 1902 edition of the same work included in the Arber's *English reprints.*

> English reprints/Edward Webbe/Chiefe Master Gunner/ His trauailes/1590/edited by Edward Arber/F.S.A.,

etc., late examiner in English/Language and literature/to the university of/London/ Westminster/ A. Constable & Co., Ltd., 1902.

The verso of this title-page is made use of as the contents page. Here is the transcript of a portion of the same:

Edward Webb'es Travels

1. Epistle to the Reader,	13
2. Dedication to Queen Elizabeth,	14
3. Acorstic on the Queen's name,	16
4. Places, etc., referred to—	
Russia, etc., Moscow,	17,18
Kaffa, in Crimea,	18
Narva, in the Baltic,	19
Italy	
Leghorn,	19
Trybusas,	23
Venice, Padua, Ferrara, Bologna, Florence,	30
Rome,	30,31,32
Naples	31,32
Palermo,	32
Egypt, etc.,	
Alexandria,	21,22,23,26,33
Cairo,	21,22,23
The Nile,	33
Crocodiles,	26
The Red Sea,	32,33
The pyramids,	33
Tunis,	35
Turkey, etc.,	
Constantinople,	20,25,29
Persia,	20,21
Syria,	
Damascus,	23,33
Jeruselem,	22,26,34
East Indies,	
Goa,	22
Armous	23

The land of Prestor John,	
(Tartarica)	23,24,25,35
France,	
Dreux,	34,35
Notes,	36

It would be observed that much of the contents of the 1590 title page find a place here. Further the contents page itself serves as a sort of an index to the book.

425 PATRON

The widespread patronage of authors by Royalties and noblemen in the Elizabethan days led to the transfer of the dedicatory part of the legend on the title-page to a separate preliminary sheet and the transfer of the contents to another preliminary sheet. This was perhaps the next move in book building. At about the same time the author was given a share of the preliminary pages, to introduce the work briefly to the reader. In fact what we now call the preface was then entitled 'To the reader'. Thus by the middle of the eighteenth century the title-page became simpler as a result of its having shared its original contents with a family of preliminary pages.

426 AUTHOR

Besides the title, the title-page contained only the name of the author, publisher, the imprint and sometimes the publisher's device.

Now the author wss given the privilege of occupying more of the title-page itself. This was used to indicate his qualifications, profession and status in life. About the beginning of the nineteenth century it became common for the author to use his region of the title-page for mentioning his other works. Naturally this was not objected to by the publisher if he himself had published these works ; even otherwise the description of the author as having brought out so many books was not without its advertisement value for the publisher.

4261 Works

This again naturally crowded the title-page too much. This additional matter on the title-page was slowly transferred to an additional preliminary sheet—the half title-page—which began to appear in the latter half of the nineteenth century. Similar to the present practice the list of the other works of the author found a place on the back of the half title-page. This page is in the alternative used to mention the different books of the series, if any, to which the book in question may belong.

4262 Estimate

In our own days some further developments are taking place. The developments are not without relation to some peculiarities found in the early forms of title-pages. A reference to the transcript of the title-page of Edward Webb's *Travels* given already will show that it contained an estimate of the book. During the years when the title-page was progressively simplified by the transfer of some of its contents to different preliminary pages, the estimate part of its contents was left out. It was not only ejected from the title-page but was denied a place even in the family of preliminary pages.

This wrong done to it is now-a-days sought to be redressed by allowing it a place at least outside the family of preliminary pages. That place is the flap of the jacket or the dust cover of a book which came into existence just at the beginning of this century. No doubt the dust jacket is not an organic part of the book and hence short-lived. Even a transient something is better than nothing and a compensation is that when a book is fresh, it is the habit of the modern reader to peruse the flap of the jacket first. With the adoption of an over-all transparent plastic cover, even the wrong of transience is removed.

This in short is the ontogenesis of the preliminary pages of a book in the European countries.

427 OTHER ADDITIONS

One of the early members of preliminary pages to establish itself was the contents page. This is a necessary member. A preface or an introduction or a conspectus is also now regarded as necessary. Generally the preface contains also the acknowledgement of the author. But in some publications as in those of the Madras Library Association, publication series, acknowledgement is separated from the preface and is given an independent status and an exclusive page. This is not the only possible addition to the preliminary pages. Foreword by a distinguished personage and the general preface to the series, if any, to which a book may belong often get some pages in the preliminary forms.

428 ARRANGEMENT

The arrangement of the preliminary pages is getting more or less conventionalised. It is now definitely the practice to have the first few of them in the following order:—

1 Leaf containing half title page ;
2 Leaf containing title page ; and
3 Leaf containing dedication.

With regard to the rest of the preliminary pages there is some variation in practice. They should be arranged in the increasing order of their help to the Fourth Law. The title page is of greater help than half title page. Of course dedication does not come into this line of thinking. Nor does acknowledgment do. I should therefore prefer to put acknowledgment on the third leaf. Next to the title page it is the contents page which gives a fuller view of the book. The Fourth Law would therefore recommend to Social Bibliography giving the contents on the fourth leaf, *i.e.*, on the first substantive leaf after the leaf containing the title page. The preface or the introduction gives the author's own estimate of the value of his contribution. It may also function as the author's brief guide to the book. It is therefore desirable to make it follow the contents page and indeed be the last element of the prels. If there is a foreword by a person other than the author, perhaps its very name will be justified, if it is inserted just before the contents page.

43 Title Page

The present formula for the make up of the title page is basically as follows:—

1 Title or name of the book ;
2 Name(s) of author(s) ;
3 Name(s) of collaborator(s) such as translator(s), editor(s), illustrator(s) and so on, if any, with appropriate words indicating the role of the collaborator(s).
4 The publisher's device, if any ; and
5 The imprint.

The imprint consists of the name(s) of the publisher(s), the name(s) of the place(s) of publication and the year of publication. The edition also may be given in the title-page, unless one prefers to give it on the back of the title page. The back of the title page may give also the call number of the book. The title is the prepotent element on the title-page. It is therefore the practice to compose it in types of the greatest weight and size and insert it in the upper part of the title page. The name of the author which is normally the next in importance is usually composed in a type of slightly smaller weight and size and inserted below the title but above the centre. This position approximates to the optical centre of the page which is higher than the physical centre. The imprint is usually given in subordinated type face at the bottom of the title page.

431 DECORATION

If we take the main purpose of the title-page to be that of helping the Fourth Law, it is desirable that it has physical simplicity without any attempt at decoration, illustration, colouring, bordering or any other addition. These would have been welcome to the Third Law. But the jacket meets all such requirements of the Third Law. If the modern practice of protecting the jacket permanently by transparent plastic cover is followed, the Third Law should be satisfied with the jacket and leave the title page entirely at the service of the Fourth Law. There can be a division of function between the jacket and the title page. Aesthetics should be the main motif in the design of the jacket. But the design of the title-page should be functional. Aesthetics should not override functional purpose.

432 DOUBLE TITLE PAGE

In Germany and other continental countries the unit of design for title-page has been taken to be " an opening " or an open double page. To my mind this appears to have been based on a faulty psychology. In the first place there is not enough matter to be distributed over two pages. In the second place while for the more aesthetic appearance the opening may be the unit, for purposes of absorbing the information given the fold and the sewing between the two pages form too great a partition to regard the two pages together as a unit. If this view is upheld it will follow that the back of the half title-page can very well be relegated to the function already described in section 4261.

44 Evolution of Title-Page

441 PROTECTIVE PURPOSES

The value to the Fourth Law, of classical simplicity in the design of the title-page took long to be realised by Social Bibliography. There has been a continuous change in the very purpose of the title-page. In the early years of printing, books were sent out to booksellers folded but unbound. They remained unbound for a long time before they were sold. In this case the first page was liable to be damaged. To protect the text from damage, the printer adopted the practice of leaving the first page blank, so that it could be cut away by the binder leaving the book whole and in good condition. This is evidenced by the transcript of the colophon given in section 421. But as in the case of the first stage in the evolution of the jacket, such a blank page in the front of a page made it an anonymous block to the inconvenience of the bookseller as well as the customer. Again as it was often turned to see what the book was, the first page of the book was exposed to damage even as before.

442 IDENTIFICATION PURPOSE

To avoid this contingency, the title or some identifying phrase came to be printed on the face of the blank. It did not take long for other information to be added after the title. This led to the development of a full-blown title-page. As soon as the title-page was thus made to carry more information than the mere name of the book, it gained in value and it too required protection. A blank sheet was added before it. The same process of evolution was gone through until this blank sheet was converted into the half-title page. To protect this half-title page again, the printer is nowadays adding a blank " end paper ".

443 ART

Originally the title page was printed in the same type as the text. But the need for diversity was soon felt and types of larger size and of ornamental face were introduced. For a long time Gothic face was used for the title page though the text was printed in Roman face. The Gothic-faced title-page was often cut in wood with very elaborate and intricate ornamentation almost to the point of hiding away or suffocating the title. Decoration became the motif instead of the satisfaction of the Fourth Law. The protest of the Fourth Law was soon heard. The decoration was made to recede to the border, and the centre of the title-page was made readable.

444 PURITANISM

The sixteenth century puritanism had its effect on the design of the title page. It hounded out all distracting ornaments from the face of the book, which the title-page was. Fourth Law indeed found a good ally in puritanism.

445 ENGRAVED TITLE-PAGE

During the seventeenth century engraved title pages became popular. This led to a revival of decoration of title-page. There was a tug of war between puritanism and Fourth Law on the one side and decoration on the other. It was finally decided as a compromise to retain the ornamentally engraved title-page and add another title-page of simple letterpress after the engraved one.

446 WORDS FOR TITLE PAGE

Originally the words scrambled over the entire title-page, cramped and crowded. This defeated the purpose of the Fourth Law. In the eighteenth century some simplification came. Indeed in keeping with the general spirit of that age the title page assumed classical simplicity. But the romanticism of the early nineteenth century brought back both profusion of words and ornament. New-born lithography freed the type-face from the limitation of the rectangular type body and letters were designed for the title-page along sentimental lines. It was not unusual for the title page of a christmas story of early Victorian period to be made of letters contrived out of icicles or twigs crowned with snow or robins. About 1870, William Morris brought this tendency to a climax much to the chagrin of the Fourth Law.

447 CURRENT PRACTICE

The simple functional design described in section 43 has now slowly established itself. The present generation is getting accustomed to this functional kind of title-page. This movement to make the design of the title-page functional is not an isolated phenomenon. This principle is now being widely adopted. In architecture for example pre-conceptions are brushed aside and new experiments are made to make the design functional in all utility spheres. Title-page belongs to the utility sphere. There is ample scope for art to express itself in such a way that the utility function is enhanced rather than suppressed. It can make the space of the title-page a forcefully subtle quality by a proper distribution of space and words. Art as well as utility can be equally satisfied. There is ample scope for the further evolution of the title-page in keeping with this symbiosis between art and utility. It is the business of Social Bibliography to exploit it.

45 Index

Among end-matter the compulsory element is the index. To get into a book without an index is like getting into a forest without a trained guide. The index has no doubt to be provided by the author. It cannot be made by the printer. It is now the practice to get it done as a piece of hackwork or to get it done by an obliging near relative or by a premature junior. I regard the index as too vital to the purposes of the Fourth Law to be treated in that indifferent way. My experience is that the author alone is the most competent indexer. Even he loses the fulness of his competence, unless he indexes the book the moment he finishes creating it.

451 DEFINITION

According to classical usage, the Latin word *index* denoted a discoverer ; a catalogue or list: the title of a book ; and the fore or index finger. Cicero (106-43 B.C.) used the word to express the table of contents of a book, and explained his meaning by the Greek term *syllabus*. Shakespeare, in the sixteenth century, used the word in the general meaning of a table of contents or preface.

Table was the usual English word, and *index* was not thoroughly naturalized until the beginning of the seventeenth century. In the present English usage, *table* is reserved for the summary of the contents as they occur in the book, and the word *index* for the arranged analysis of the contents. The words calendar, catalogue, digest, inventory, register, summary and syllabus are also used to denote *index*. Another old word occasionally used in the sense of an index is " pye ". The French occasionally use " *index* ", but generally employ the expressions : " Table de noms des auteurs " and " Table de sujets " ; the German expressions are " Autoren Register " (author index) and " Sach Register " (Subject index); Italian term is " tavola ".

The *New English dictionary* affords an interesting study of the many meanings with which the word *index* is associated—in mathematics, mechanics anatomy and music. But the main definitions with which we are concerned are : (a) A table of contents prefixed to a book and (b) An alphabetical list placed (usually) at the end of a book, of the names, subjects, etc., occurring in it, with indication of the places in which they occur.

452 HISTORY

" There is no greater literary sin than the omission of an index ", declares E.B. Osborn in his essay on indexing. The need for an index and its usefulness are recorded from the earliest days.

Seneca (4 B.C.—65 A.D.) in sending certain volumes to his friend Lucilius, sent along with them notes of particular passages, in order that " he who only aimed at the useful might be spared the trouble of examining them entire ".

Thomas Fuller (1608-1661) fully realised the value and importance of indexes. He says, " An index is a necessary implement, without which a large author is but a labyrinth without a clue to direct the readers within."

4521 Eighteenth Century

In 1750 Dr. Johnson wrote to Samuel Richardson entreating him to add an *index rerum* (index of subjects) to each volume of *Clarissa Harlowe*. He says, "When the reader recollects any incident, he may easily find it," with the aid of an index. The value of the index was recognised not only by individuals but by the whole nation. This is substantiated by the fact that in 1778 a sum of £12,900 was voted for indexes to the *Journals of the House of Commons*.

Isaac Disraeli's (1766-1848) praise of the inventor of indexes is worthy of quotation : "I for my part venerate the inventor of indexes ; and I know not to whom to yield the preference, either to Hippocrates, who was the great anatomizer of the human body, or to that unknown labourer in literature who first laid open the nerves and arteries of a book."

4522 Nineteenth Century

While the eighteenth century was an age of advocacy, the nineteenth was one of agitation in favour of indexes. It has been said that the "omission of an index, when essential, should be an indictable offence." Both British and American lawyers have proposed that any author who published a book without an index should be deprived of the benefits of the Copyright Acts. Lord Campbell (1779-1861) once proposed to bring a bill into Parliament to implement this idea.

4523 Social Pressure

The great delay in the setting in of the practice of providing the printed book with an index is largely traceable to late appearance of universal education. Though printing was invented in the fifteenth century and books were made comparatively cheap and plentiful, the conservatism and bigotry of the literate and educated few were indifferent, if not obstructive, to the spread of literacy among the masses. Even in England it was only seventy years ago that elementary education was made compulsory by legislation. We do not know when we shall have universal literacy in India. The percentage of literacy has just reached two digits.

When only the select few use books the probability is that they are men belonging to the uppermost centiles of the community. This implies that the select literate few who alone use books have an unusual memory and a remarkable familiarity with literature. Such people may not depend very much on indexes. No wonder the need for indexes was not felt for nearly three centuries after the invention of printing.

But when the lower quartiles of the community became literate and began to use books and books themselves became far more numerous overreaching even the memory of the uppermost quartile, the index naturally became a necessity. This social change set in only in the nineteenth century, and it accounts for the index tending to become a normal feature of the printed book more definitely after the commencement of the last century. If we remember this dependence of the evolution of the index-consciousness on the spread of literacy and couple with it the fact that more than 80 per cent of our countrymen are illiterate, is it a wonder that even the few worthwhile books produced in India, often go without an index ? It is all a matter of social pressure.

453 QUANTITY

Even in this period for a long number of years the index has been very meagre. Sir Humphry Devy's *Elements of agricultural chemistry* (1813) has an index of four pages to a text of 386 pages. A.H. Bleeck's *Avesta* (1864) whose text covers 211 pages devotes only a page and three quarters for the index. In G. Maspero's *Struggle of the nations* (1896) the index occupies only six pages whereas the text runs up to 788 pages. This meagreness persists even to-day in several books. W.T. Jackman's *Economic principle of transportation* (1935) whose text occupies 881 pages devotes only eight pages and a quarter to the index. Findlay Mackenzie's *Planned society* (1937) has but an index of eleven pages to a text of 978 pages. Walter E. Lagerquist's *Public utility finance* (1927) devotes but four and a half of its 671 pages to the index.

At the other extreme we have a book which provides an index of two pages to a text of two pages. It is T.T. Sharman's *Kannada poets mentioned in inscriptions* (Memoirs of the Archaeological Survey of India, 13), 1924. Verily it has virtually repermuted the words of the text in an alphabetical order to form the index.

The correct quantity surely is between these two extremes. In my books, the question of determining the most helpful quantity of index had been borne in mind. Indeed in several senses their indexes constitute experiments in indexing. They would indicate a proportion of 1 : 30 as the norm for the proportion of the length of index to that of the text.

454 OCCURRENCE

Usually the index occurs at the end of a book. The only cause of occasional confusion is due to appendices, annexures and supplements either preceding or following the index without conformity to any accepted convention.

4541 Periodicals

But in periodicals the index may occur either at the end or at the beginning though the former is more often the case. Here are five periodicals to illustrate the occurrence of the index in the preliminary pages :

1 Nature :
2 Annals of botany (New series) ;
3 Annals of applied biology ;
4 Lancet ; and
5 British medical journal.

4542 Abstracting Periodicals

In my *Classified catalogue code*, edn 3, 1951, section 9103, the specification is that the Alphabetical Index of Authors and Series, the Alhphabetical Index of classes and the classified Index of Entries should all precede the Text in an abstracting periodical. This is believed to be more helpful to the fulfilment of the Fourth Law.

4543 LAW BOOKS

Law books present another deviation from normality. They often present an index of cases in addition to the general index. A rigid convention has not been established in regard to the position of the index of cases. Earl of Birkenhead's *International law* (1927) gives the table of cases at the end of the book just before the general index. On the other hand in K.V. Krishnaswami Ayyar's *Professional conduct and advocacy* (1939) the index of cases occurs before the text of the book.

4544 Multi-volumed Books

Multi-volumed books give rise to another kind of lack of uniformity in the occurrence of indexes.

In some cases each volume has its index but the set as a whole is left without a cumulative index. An example is B.A. Yeaxlee's *Spiritual values in adult education.* 2 V. (1925).

In other cases there is cumulative index at the end of the last volume but no index in each volume, e.g., J.D. Hooker's *Himalayan journals*, 2 V. (1854).

In rare instances the cumulative index is repeated in all the constituent volumes as in J.A.L. Vaddell's *Bridge engineering*, 2 V. (1916).

It is not unusual for each volume except the last having its own index and the last volume giving the cumulative index of the set as a whole. This is illustrated by J.W. Mellor's *Comprehensive treatise on inorganic and theoretical chemistry*, 16 V. (1922-1937).

A still another variety of occurrence is each volume having its own index and the cumulative index of the set forming a separate volume by itself. A well-known example of this is the *Cambridge modern history*, planned by the late Lord Acton, 13 V. (1907-1911).

Apart from these simple types we may have various complications, e.g., J.G. Frazer's *Golden bough* (1911-1915) which is in twelve volumes devotes the whole of the twelfth volume partly for bibliography and partly for the cumulative index of the set. In addition, Vols. 3, 4 and 9 have each their own exclusive index, while the remaining volumes fall into four pairs, the volumes of each pair sharing a common index.

Another example is M. Guizot's *History of France*, 8.V. (1882). Here the index of the first five volumes occurs at the end of the fifth volume, while that of the last three volumes occurs at the end of the eighth volume.

Usually each volume of a periodical has its own index. The ideal is to provide a cumulative index at stated intervals, say, once in ten years or twenty-five or fifty years. Such cumulative indexes occur as extra volumes of the periodical. In actual location on the shelves they are best kept at the head of the volumes of the periodical. A periodical that is most regular in this is the *Chemical abstracts* published by the American Chemical Society. It brings out a volume of cumulative index every ten years. So is the case with *Annalen der Chemie* and the *Berichte der deutschen chemischen Gesellschaft.*

4545 Cumulative Index

Some periodicals give a cumulative index of a number of consecutive volumes at the end of the last of them, e.g., *The American journal of science and arts*, issues a cumulative index for ten volumes at the end of every tenth volume and these indexes are inseparable from the regular volumes of the set. This practice is a source of irritation.

But a far more deceptive and hence dangerous occurrence of the cumulative index will be found in the *Journal of the American Oriental Society*. Here one of the regular volumes (Vol. 21 first half) of the periodical is converted into a cumulative index of the volumes going before it. In such a case it is awkward to lift this cumulative index from its proper numerical order to the head of the set. At the same time if we leave it where its volume number indicates, readers often miss the existence of the cumulative index. In V. 44, pages 313 to 384 are devoted to the cumulative index to volumes 21-40. Here even the choice of removing the volume to the head of the set is denied and the index is destined to lie hidden in the shelves along with the other volumes of the journal.

455 KINDS

4551 Classified

A rare form of index is the classified one. Paul Monroe's *Cyclopedia of education* provides such an index. Classified arrangement may have its value in a bibliography or a library catalogue. But it must be held to be rather out of place in the index to a book. There are two reasons for this. In the first place the index to a book is in actuality to be used by every reader of the book whereas a bibliography or a library catalogue has only a much smaller number of users. A select small class of people can with ease acquire the special skill for using a classified arrangement but not everybody. Secondly even in the case of such a select and small class of readers the tempo in which they are at the moment of turning to the index of a book, while reading or consulting it, is seldom one that will tolerate anything more than a simple alphabetical arrangement. No doubt, an alphabetical arrangement is not after all so simple. In spite of it, one has the belief or illusion that it is something very simple and this is what counts for the tempo. Even apart from this, in spite of its pitfalls and idiosyncrasies, the alphabetical arrangement may not be as difficult to use as a classified arrangement.

4552 Multipartite

Another class of index which often proves to be irritating if not deceptive is the multipartite alphabetical index—an index in which the entries are not given in a single alphabetical sequence but are broken into a number of sequences. The greater the number of such sequences the more ineffective the index becomes. Bipartite form is the more common one, e.g. :

1 H.N. Russell's *Astronomy* has a name index and a subject index ;

2 S.R. Daniel's *Case for electoral reform* is pro-

vided with a subject index and a personal index ; and

3 L.H. Haney's *History of economic thought* calls its two sequences " Index to names " and " General index ".

If bipartite index is bad, a tripartite one is worse. The editor of the 1939 edition of Leonardo Da Vinci's *Literary works* would have helped the reader better if he had coalesced the following three indexes into a single one :

1 Names and bibliography ;
2 Topographical index ; and
3 General index.

It is hardly possible to guess the motive behind the breaking up of the index of Watkin Williams' *Saint Bernard of Clairvaux* into three sequences like, index of persons, index of places and index of manuscripts cited.

This purposeless dissection of a homogeneous alphabetical structure reaches as it were its extreme form in G.C. Wheeler's *Mono-Alu-folklore.* For he provides no less than four indexes, viz., index to motives, index to flora, index to fauna, and index to places.

456 BLOCK INDEX

Till about the middle of the nineteenth century, books were usually given a " Block Index ". Here is an example of it for the item " Index entries " as it would be for my *Classified catalogue code.*

Index entries—02 *comm.* ; 3 ; 3-336 ; 523 ; 613-61384 ; 623 ; 73-7323 ".

If the index entry were of this block type the reader, who is interested in the number of index entries to be given to a publication, may be baffled as to which of the references he should look up. Perhaps, he will try each one systematically. If so, he will consider himself lucky since the very first reference will give him what he wanted. But if his interest centred round " Index entries for periodical publications " he would have to meet with disappointment in the first six attempts of his and find what he wanted only in the seventh attempt. To get at this he must be of dogged nature and one not easily scared away by failures. A colossal instance of this fault of a block index entry will be found in Ayscough's *Index to the gentleman's magazine* where all the references under one surname are placed together undifferentiated even by the Christian name. There are 2411 entries under " Smith " and it has been calculated that to go through this mass in order to find a specific reference would take the consulter eight days of ten hours a day !

Much less formidable examples of ineffective block index entries are scattered throughout volume 15 of *The Cambridge history of English literature* which is entitled *General index*. Under " Shakespeare " we find one column of references—nearly four hundred references. To look up these references will take about twelve hours. Surely, human inertia and impatience are not going to stand this nonsense. Further, they will be egged on by disgust, as many of these references will turn out to yield nothing more than the name " Shakespeare ".

A few weeks ago a young man wanted the significance of *Pranava—Aum.* The student was given the three volumes of Bhagavandas's edition of Gargyayana's *Pranava veda* which had the title *Science of the sacred word* (1913). Not finding an index entry under *Pranava* he turned to *Aum*. He had a feast of sixty-six references. He looked very pleased and settled down at a desk. By the time he looked up the first twenty of these references his patience left him and, alas, along with it even his interest in *Aum*! Surely, what is the purpose served by such block index entries? No doubt, some indexers try to make the best of a bad bargain by printing in antique type the references which give more sumptuous information or by putting such references prior to all the others.

457 RELATIVE INDEX

It is extraordinary to think that this obvious futility of block index entries came to be realised only so late as the days of Melvil Dewey. It is believed that it was Melvil Dewey, the father of modern librarianship, that first advocated and practised, if not invented, the relative index. Here is an example of relative index entry taken from my *Classified catalogue code* of 1934:

> Index entries, for—artificial composite books, 623; multivolumed books, 523; ordinary composite books, 613-61384; periodical publications, 73-7323; simple books, 3-336; number of, 02 *comm*; types of 3.

Here the main entry word is "Index entries". The entry shows that this word occurs in seven different places in the book. Actually it furnishes more information for it indicates what aspect of "Index entries" is dealt with in each of the seven places, e.g., one interested in the number of index entries is told straightaway that he will find his information in the *comm.* to rule 02.

But now that Dewey has shown us the way by devising this extremely simple device of relative index, there is no excuse whatever for any author to give a mere block index and claim to have indexed his book, at any rate no more excuse than for leaving the book without any index.

The index to E.T. Cook's library edition of the *Works* of John Ruskin (1912) is an admirable example of relative index.

In a relative index, entries, which have more than one reference, are split into several entries which all have the same main heading but get individualised by different subheadings.

458 EXPRESSIVE INDEX

It was stated that a particular reference may contain nothing more than the mention of the name indexed. In such cases a reader may well have the feeling of one on whom a fraud has been played. This fault is not peculiar to block indexes only.

4581 Etiology

Even relative indexes may have such disappointing references, e.g., in the index to Ruskin's Works above referred to we find the entry :

> "Hunt, William Holman (2) Characteristics, etc., of his work :—R's lecture on (1883), 33 xlvi., 267."

On turning up these pages we find but the bare mention of the topic in the former page, viz., " In the Lent Term, however, he delivered only the first lecture—on Rossetti and Holman Hunt ". But on turning to the latter page we find that it commences the lecture itself which extends up to the end of page 286. It may be argued that the fact that the first reference is only to a preliminary page should be sufficient to warn a wary reader that he should expect in it nothing more than the mention of the name.

But here is another example:

" Milton, John (2) *General criticism* :—flowers, 4, 255 25, 245, 393. "

The first of these references gives nearly a full page comparison of " Milton's flowers in Lycidas with Perdita's ". This page quotes seventeen lines of poetry. In the second reference we have but the mere mention of the word " flowers " included in the following sentence: " Milton fills his paradise with flowers ; but no flowers are spoken of in Genesis " and the related footnote contains three lines from *Paradise lost* IV. In the third reference we have more than one page on the treatment of violets and pansies by Shakespeare and Milton with just a few lines of quotations but with the focus on how the lines of the two poets " are dragged from hand to hand along their pages of pilfered quotations by the hack botanists ". This aspect of flowers—comparing the poets' and botanists' way of handling the subject is continued through a number of succeeding pages. Here certainly it cannot be maintained that the reader gets any clue in the index entry in spite of its being relative, that the second reference merely contains the mention of the word, that the first is largely made up of quotations and that the last is not only focussed on something else but is an elaborate description of the handling of the theme of flowers.

The next step to be taken in improving the indexes of books is to indicate such differences in treatment—differences which are not brought out by the ordinary relative index.

4582 Specification

The indexes of my later books are new experiments of indexing with a view to solving this difficulty. The experiment consists of a very simple device. It elaborates Dewey's method of relative entry by introducing in appropriate places the four following descriptive symbols which stand for the index shown against them:

d.i.r.t. = described in relation to,
i.r.t. = in relation to,
q.i.r.t. = quoted in relation to,
r.i.r.t. = referred in relation to.

How these symbols help us out of the difficulties mentioned above will become clear by the following examples taken from the first volume of my *Reference service and bibliography* (1940):—

1 Shaw, Bernard, incident, 12331. Ex. *r.i.r.t.* Multi-worded entry words, 221218.
2 *New English dictionary—d.i.r.t.* Scope of dictionaries, 22114. Ex. 1. *q.i.r.t.* Defini-

tion of bibliography, 4013. Definition of library, 112. *r.i.r.t.* Genesis of reference service, 11224. Reading lists, 411.

3 *Dictionary of national biography—d.i.r.t.* Author's bibliography, 4121. Ex. 1. Scope of biographical reference books, 221114. Ex. 1. *i.r.t.* Iconographical information, 2322. Ex. 2 *r.i.r.t.* Devil worship incident, 344. Professor of Economics incident, 2322. Ex.1. Scope of reference books, 2211 Ex.

In the first-mentioned example it should be obvious that the second reference contains the name of the incident, while the first gives a full account of it. In the second example it would be obvious that the last two references contain merely the name of the book and that the first reference gives a description of the book, while the remaining two references contain quotations from the book. Similarly in the third example the first two contain a description of the book ; the third reference evaluates the book from a particular point of view ; and the last three references merely mention its name. All such helpful information is furnished with the aid of the simple symbols *d.i.r.t.* ; *i.r.t.* ; *q.i.r.t.* and *r.i.r.t.* This, I call, " expressive index ".

4583 FUTURE

This is by no means the last word in the evolution of an index to a book. When this experiment is perfected then only further lacuna will be disclosed calling for further attention. Indexing is thus by no means an exception to the general rule that so long as man continues his thinking there will be opportunity for every one of his ideas and tools to be progressively improved *ad infinitum*. Social Bibliography has a great opportunity in devising even a more effective form of index in saving the time and the tempo of the reader to the full satisfaction of the Fourth Law.

4584 Social Pressure

It must be realised however that there are some intrinsic reasons for slowness of progress in the improvement of the index. So long as only individual readers use index, the difficulties they meet with in the existing indexes, however formidable and exasperating at the moment, are soon forgotten. There has been till now no means of so cumulating all such experiences as to lead to a concerted attack on the difficulties. However the advent of reference service is full of potentialities for providing such a means. As reference service gets properly evaluated and gets widely and intensively established in all libraries, the reference librarians will be not only the custodians of the difficulties experienced by individual readers but also the persons who depend on indexes for the moment-to-moment discharge of their duties. The difficulties of inefficient indexes cannot be forgotten by them. They will have to be removed by them.

46 Other End Material

It is now realised that the Fourth Law can be helped by adding other items to the oddments at the end of the book. These items may include : (1) Appendices, (2) Notes and supplements, and (3) Bibliography. These are not matters which the printer can provide of his own accord. It is for the author to produce them. But the printer and the publisher should find a proper place for them. In the light of the Fourth Law, Social Bibliography would suggest that they be included in the end matter of the oddments.

47 India

The lay-out of the books printed in India today is still in a formative stage. Even the title page does not occur in some cases. The contents page is omitted more often. Half-title page is rare except in books printed in English. So much about the preliminary pages. With regard to end matter very few books give an index. These are all matters of great concern to the Fourth Law. Social Bibliography should take care of the lay-out of books in India. It should in particular insist upon the provision of index.

471 EVOLUTION OF TITLE-PAGE

With regard to the evolution of the title-page in the printed books in Indian languages in India, it is believed that they have had to run the same course in all the languages. Moreover in the imitation of the colophon in the earlier books and in the progressive thinning out of the matter put on the title-page we find more or less parallelism between the early Indian books and the early European books. As my experience is limited to Tamil books, I am giving here some account of the evolution of the title-page of Tamil books.

472 CONFLICT OF LANGUAGES

4721 Latin

Probably, the earliest Tamil books had their title-pages in Latin, English or some other language. The first Tamil work printed in 1578 bears the following title:

> O Flos sanctoru, a doutrina christae hu copios Confessionaris and outras livros.

Copies of this do not appear to be available. It was again printed in 1579. No copy even of this is now available in India. The only copy now extant is in the Bibliotheque Nationale at Paris. In 1941 I was able to get a photograph of the title-page and of the colophon of this copy through the courtesy of the Vice Principal of the Sacred Heart College, Shambaganur, Madura District. These are reproduced in the adjacent plates.

Here is another example:—

> Vocabulario Tamulico coma dignificacao Portugueza comp-de Jesu, Mission de Madure.

This work was probably printed in 1647.

473 BILINGUALISM

Then came the bilingual title-pages. At the next stage of evolution, the title-pages were rendered into more than one language, of course one of the languages used being Tamil. The rendering in the two languages appeared either on the same page or in adjacent pages. Here is an example of the title in Tamil on one page and rendered into another language in an adjacent page.

Iiannis Arndtii

Sacrorum Per Principitavum Lune- /Burgenesem
olim Aptistitis,/de/Vero Christianism. /Liber primus.
Ex germanico in Tamilicum/Convertit/Beniamin
Schulzivs,/Missionarius Evanzelicus/(Design)/
Halae Magdeburgicae/1751

The following is the transcript of the Tamil title-page.

உணமையுளள | கிறீஷததி யாததினுடைய | மகிமையை | தெளிவாக காணபிககிற | ஞானகணணாடி | அதினுடைய மூதலாம பொஷததகததிலே | அடஙகியிருககிற சஉ-அதிகாரஙகள.

கிறீஷதது பிறநது ௲௭௱௫௧ வருஷமாகிற பொதுசா சொனிலேயிருக்கும ஆலே | எஙகிறபடடணததிலே | யீது அசசிலே பதிககபடடது |

Or as in the following case, on one and the same page we may find the rendering of the legends in two languages:

தமிழும இஙகலேசுமாயிருககிற | அகராதி |

A/Malabar and English/dictionary,/wherein the words and phrases/of the Tamulian language, commonly called/by Europeans the Malabar Language,/are explained in English/by the English Missionaries of Madras. /Printed at Wepery near Madras in the year 1779./

This bilingual stage appears to have been common in the case of many translations before 1800.

473 PUFF

Again most of the Tamil books published before the nineteenth century were religious tracts published by missionaries and their title-pages contained many puffs. Here is an illustration:—

மனுஷச சாதி இரடசிககபடுவதறகாக | சறுவலோக
தயாபரரான கறதா | அருளிச செயத | சததியவேதம |
பழைய உடனபடிககையின | மூனரும பஙகு | இதிலே
அடஙகியிருககிறது | ஞானசஙகிதஙக்ளுககு சாலோமோ
னின | வாககியஙகளும் பிறசஙகியின | பொஸததகமும,
சாலோமோனின | பாடடு நாதானே | முநதினதிலததிருதத
லான இரணடாம பதிததல

இது கிறிஸதது பிறநத | ஆயிரததேழு நூறறு தொண
ணூததோராம | வருஷம | தரஙகனபாடியிலே | மிசியோன
அசசுக கூடததில ப்திககபடடது.

474 AMPLITUDE OF VARIATION

Meanwhile, it has to be stated that a single press came to wield a great influence on Tamil printing. It was the press made over by the Government of Madras in 1761 to the Vepery Mission. From that year to this day it has been active except between 1810-1819 and 1861-1866. Tarde's laws of imitation seem to have set in and several presses were established in emulation of this press. But many of these indigenous presses which had neither a tradition nor a standard to follow, simply drifted in regard to the art of book-building particularly in regard to the title-page. At the one extreme many books appeared without title-pages and at the other extreme we had hold-all title-pages similar to that of Edward Webb's travels, a transcript of which has already been given in section 424.

Here is an example illustrating the point:

—| ஸ்ரீராம ஜெயம் | இராம நாடகமென்று | வழங்கு
கின்ற | குசலவ நாடகம் |—| இதனுள் ஸ்ரீராமர் அரசிருத்
தல்—சீதை பிரிதல் | வால்மீகராசீர்மத்திற் பிள்ளை பெறல் |
லவன்—குசலன்—உயுத்தம்—அஸ்வமேத யாகம் | குசலவ
னுக்குத் திருக்கல்யாணமும், இளவரசு பட்ட | மும் அடங்கி
யிருக்கின்றன. | இஃது | திருவண்ணாமலை | வேங்கடாசல
முதலியார் | அவர்களால் | பரிசோதித்த பிரதிகிணங்க |
கோகுலாபுரம் அருணாசல முதலியாரால் | பார்வையிடப்
பட்டு | சேலம் | சுப்பருய பிள்ளை அவர்களால் | கொண்
ணூர் | மாணிக்க முதலியார் | கம்பெனியாரவர்களது
மனோன்மணி விலாச அச்சுக்கூட்டத்திற் பதிப்பிக்கப்பட்
டது |— | ஈஸ்வர—வைகாசி | [Block] | ரிஜிஸ்தர் காப்பி
ரைட | ஐந்தாம் பதிப்பு—காப்பி 1000.

In the above title-page it may be noted that the author's name is conspicuous by its absence.

This involved and unbalanced state of the legends in the title-page might be traceable to the inexperience of the printers in the art of book-building. Also, not infrequently one meets with title-pages wherein the author's name is altogether hidden away in small type whereas the name of the patron or some other influential person is rendered in display type.

475 INFLUENCE OF SWAMINATHA AYYAR

But from the beginning of this century a change is noticeable. It is perhaps due partially to the influence of western methods of book-building on the authors. For now-a-days the author himself plays the part of the publisher and hence has much freedom in the matter of designing the title-page of his work For example the later works of Mahamahopadyaya Dr. V. Swaminatha Iyer show the way in simplicity and directness in the matter of the pieces of information on the title-page.

476 SPECIFICATION OF YEAR

In the case of Tamil books there is another possibility which should be avoided. If the year is mentioned in any era other than the Christian, the name of the era should be given. Also it is by no means sufficient to mention the name of the year in the sixty years cycle : *Prabhava*, *Vibhava*, etc. Printing has been in vogue in the Tamil country for many such cycles and, for aught we know, it will be continued through many such future cycles.

48 Message of Social Bibliography

Hustle has become a regular feature of life today. This hustling temperament is probably a result of the high pressure at which life has to be lived today. This accounts for the increasing importance of the Fourth Law in Library Science. Social Bibliography has therefore to do everything possible to save the time of the reader (1) in spotting out his book ; (2) in a rapid assessment of the book in the first instance ; (3) in the second approximation of the assessment ; and (4) in a third approximation of it.

481 FIRST MESSAGE

For this purpose its first message is directed to printers and publishers. It is : "Tool the title and the name of the author prominently on the spine of the book, make the title page restive, uncrowded and revealing. Give a contents page which spreads out the spectrum of the book as it were in a short compass. Give also a brief but clear conspectus of the book as the last item in the preliminary pages. Divide the book into chapters and paragraphs each of which observes the principle of unity in its own measure. Give proper headings to most of the paragraphs. Fit the heading of each paragraph with a hospitable, mnemonically expressive, and properly modulated system of numbers in decimal fraction notation. Provide page headings made of the short title of the book for the versos and the name of the chapter for the rectos."

482 SECOND MESSAGE

The second message of Social Bibliography, in its eagerness to fulfill the demands of the Fourth Law, is turned on the authors themselves. It is: "Provide each book with a profuse—nearly exhaustive—expressive, relative index. An index whose length is less than a thirtieth of the length of the text is not likely to save the time of the reader when he comes back to the book again and again to pick up some odd information or to verify his memory on some point."

483 THIRD MESSAGE

The third message of Social Bibliography is turned on standards organisations—the Indian Standards Institution for example and the International Standards Organisation. The message is "Don't interfere with the design of the title page. It is a work of art. But do establish helpful standards for the contents page in the preliminary pages and the index in the end matter. There should be two different standards for the index—one for books and bound volumes of periodicals and another for bound volumes of abstracting periodicals."

CHAPTER 5

Fifth Law and New Incarnations

The Fifth Law is " A library is a growing organism ". Growth can be phylogenetic as well as ontogenetic. In nature, continued experiment in ontogeny through thousands of generations, leads to further stages in phylogeny calculated to be more efficient or more suitable to change in environment. This is true of all growing organisms. It is true also of the library. In physical bibliography we are concerned only with the growth of a library in reading materials. To trace the effect of the Fifth Law we have really to begin by examining the phylogenetic changes in the physique of the reading materials themselves. We had seen in chapter 1 how the physical form of the book changed from the base of heavy, bulky, rigid stone through several stages, until it has now reached the base of light, compact, flexible paper. In the phase in which paper has been the physical base, we can recognise the manuscript stage and the printing stage. It looks as if we may soon either abandon paper as the base or at least supplement it with film. In either case the size of the book is reduced to micro-dimensions. We shall study the effect of manuscript stage, printed book stage and micro-form stage on Social Bibliography. In the case of the first two stages, it is the process of binding that was most affected. In the case of the third stage, binding is eliminated ; but several new problems arise,

51 Manuscript Age

In the manuscript age a book took several months to write. There was often only one copy. There were only very few books. Therefore books were both scarce and precious. Just as writing was done by hand, binding also was done by hand. It took a few days to bind a single copy. This was not considered extravagant in view of the several months taken to write it. Because the book was scarce, the binding was made very strong. Because it was precious, books were given exceptional bindings. They were often encased with gold and silver and set with jewels.

511 STYLE OF BINDING

Manuscripts were usually of a large size. Their binding was equally massive. The boards were of wood. Sewing was of leather thongs. The ends of the thongs were fastened into the boards. The boards were kept shut by metal clasps. Leather used for covering was thick. It was protected by metal corners. The number of persons employed in the binding trade was smaller than the number of persons employed as scribes. The cost of binding a book was very much smaller than that of copying it.

52 Age of Printing

When printing was invented in the fifteenth century, copies of books were produced more rapidly and more books were produced. But there was no invention to save the binder's time. The proportion of the time taken to bind each copy to the time taken to produce it, was too high. The quantity of leather required also became too much. Half-binding was therefore resorted to. Some little tools were also invented for the rapid duplication of the decoration of binding. As books became smaller in size, paper boards were substituted for wood and silk ties for metal clasps. By 1500, ties were dropped. In spite of these improvements in binding, the outcome of the printing press was becoming increasingly beyond the capacity of the binder's trade. Books were therefore often issued in limp vellum wrappers leaving it to the individual owners to bind them permanently.

521 PRINTING MACHINERY

When machine press came into use early in the nineteenth century, the number of copies produced began to increase even more rapidly. Still the binding trade was not helped by machinery. All its work had to be done by hand. Some economy in materials was made by the use of textiles in place of leather. Still the reduction in the cost of binding by hand was negligible when compared with the reduction in the cost of printing huge editions of books with machinery. Therefore, as stated in section 311 books were issued in paper covers or boards leaving it to the individual owners to bind them permanently. This is still the practice in some of the countries within the continent of Europe.

53 Binding Machinery

As books began to spread among the poorer classes they found it too costly to have them bound privately.

Thus social pressure was created to provide the binding even before the book was sold and to reduce the cost of binding. As usual, necessity was the mother of invention. By 1825, A. Leighton is said to have brought out editions ready bound in machine-made cloth cases. There is no need whatever to make the binding of the different copies of an edition differ from one another. There is no individuality to be respected among different copies. There is nothing to prevent one from treating all the copies as mutually replaceable. It is in these impersonal conditions that machinery fits in naturally and without any harm. There are now machinery practically for every operation in book binding. Here is a list of the machines in the family of book binding machines.

1 Folding Machine. Its business is to fold the printed sheets. It can fold in one operation four 16-page signatures. It can make 3,000 such operations in an hour.

2 Bundling Machine. Its business is to squeeze the air out of the sections and tie them in bundles suitable for handling.

3 Gathering Machine. Its business is to gather the signatures and complete the books.

4 Sewing Machine. Its business is to sew the sections on tapes or cords. It can sew about 3,000 sections per hour.

5 Nipping Press. It is a semi-automatic press capable of exercising a pressure of ten tons. Its business is to press the sewed books.

6 Trimming Machine. This is a three-knife machine. Its business is to cut and trim the three edges of the book.

7 Glueing Machine. Its business is to apply glue at the back of the sections and attach them to one another.

8 Rounding and Backing Machine. Rounding and backing are done simultaneously on the same machine. This machine can turn out 1,500 books an hour.

9 Triple-lining Machine. Its business is to apply the paper lining and the head-and tail-bands.

10 Board-Cutter. This is a rotary cutter to cut the boards forming the inner core of the covers of the book.

11 Slitting Machine. Its business is to cut the cloth used as covering material.

12 Case Making Machine. Its business is to cover the boards with the cloth and fix the cloth properly on the boards.

13 Casing Machine. Books are fed into this machine. Pasting, positioning the case and discharging the book are all automatic in this machine.

14 Pressing Machine. This is a power press in which bound books are kept for some hours before they are released for use.

The binding which is done by these machines is called "Casing". It is also called "Edition Binding".

531 SHEET WORK

" Sheet work " is the generic name for the three operations, folding, gathering and sewing.

532 FORWARDING

" Forwarding " is the generic name for all the operations of binding a book after the sheets are fastened together. It includes trimming, glueing, rounding, packing, case making and covering.

533 FINISHING

" Finishing " is the name given to the decoration, if any, which is made on the covering material of the binding and the edges of the book.

54 Pressure on Space

A library can grow in readers, staff and reading materials. As readers are mortals, there is a limit to the number of readers. So it is with staff. But the reading materials are relatively immortals. There can therefore be no limit to the growth in the number of reading materials. This unending growth in it calls for unending growth in shelf-space and therefore in library building. If every library retains all its reading materials for ever, the whole of the earth's surface will have one day to be given up to libraries ! This threat of the Fifth Law has led to the realisation that growth can be of two kinds : Adult Growth and Child Growth. In adult growth, growth does not involve over-all increase in size, but only replacing of the cells in rotation. In child growth, on the other hand, there is continuous over-all growth in size. Library organisation has now been led, by the joint direction of all the Five Laws of Library Science, to maintain only one library in each nation in the status of child growth and to reduce all the others to the status of adult growth. The status of child growth is given only to the National Central Library. All the other libraries are made to submit to a ceiling in the number of books they can have on their shelves. Such an organisation is no doubt backed by library co-ordination and co-operation to secure that every reader gets his book as and when he requires it. This chapter has therefore to do only with the ever-growing National Central Libraries.

541 INTENSITY OF PRESSURE

Yes. National Central Libraries have to be ever-growing. How fast do they grow ? My experience with the Madras University Library gives an idea. It began with 7,000 volumes in 1910. By 1930—*i.e.* in twenty years—it grew to as many as 70,000. It increased ten-fold in the twenty years. But for the Second World War intervening, it would have increased three-fold in the next twenty years, *i.e.* by 1950. It is estimated that, in a developed country like the United States of America, the National Central Library has been for some years doubling its number of volumes every fifteen years. This growth in geometric progression has already created considerable difficulty in stack room space.

542 PRESSURE OF DEMOCRACY

It looks as if this rate of growth in National Central Libraries will persist for a long time in most of the countries. This is a result of the democracy of learning. The nation has now to provide books on any given subject in a large number of standards, in order to satisfy the great intellectual-scatter among its people. Again a nation has to provide such a variety of books on every conceivable subject in order to satisfy the great subject-interest-scatter among its people. These two factors alone stimulate a large down-pour of books which each National Central Library will have to receive and house permanently. Democracy in education is responsible for another factor. It makes many more people write books, than in the earlier ages. This also increases the volume of the down-pour of books on National Central Libraries.

543 LOCATION OF NATIONAL CENTRAL LIBRARY

Wherever the National Central Library will be located—even if it is located in unoccupied areas—its down-pour will create space problem sooner or later. But a National Central Library is necessarily to be located at the seat of the national government. It is a vital social institution. It cannot be cut away by distance or time from the ministries of the government. Moreover the majority of the people cannot afford to go on a pilgrimage to an uninhabited place to find their books. On the other hand, the First Law would insist that these should find their books in the city to which they will have to go on other business now and again. Moreover the ministries themselves will need, for their deliberations, the reading materials deposited in the National Central Library. The most important of these which the ministries will require are the publications of the foreign governments received in exchange according to the treaties or conventions on the subject, the publications received under the Copyright Act, and the exhaustive collection it is expected to build up on all subjects of interest to administration and policy-making. This central station of thought-energy can be of the greatest benefit to the nation only if it is in its metropolis. This location of the National Central Library makes the space problem acute.

544 PAST REMEDIES

In the past this problem has been faced by extending the stack room vertically rather than horizontally. A stack tower, which begins perhaps 20 ft. below ground-level and goes up about a 100 feet above it, has been taken as a solution. Perhaps the situation can be met in this way for a few more decades in most of the National Central Libraries of the world. But the growth in stock is sure to go beyond the capacity of any such solution one day or other.

545 FORBIDDING SHELF-LENGTH

There is also another difficulty which is a concomitant of the shelf-length of a library running to several tens of miles. Such a length of shelving becomes forbidding even if the entire shelving is in one and the same building. If exigencies of space make it necessary to transfer the older books to a far off dormitory, as it is now being done by France for example, accessibility gets even more unhelpful. All this points to the formation of a crisis as a result of the persistent operation of the Fifth Law in National Central Libraries.

55 New Incarnation

We have to examine whether something cannot be done with the embodiment of the book, itself to meet this crisis. That is the direction along which Social Bibliography will have to explore in order to escape the pressure of the Fifth Law. As we have seen in Chapter 1, expressed thought has passed through several incarnations—spoken word, book on stones, book on bricks, book on leaves, book on barks, paper manuscript and printed book of paper. Till now thought had to move from one incarnation to another to meet the demands of democracy. It has now to look for another incarnation in order to meet the problem of space. It looks as if it has already done so. The new incarnation, it proposes to take, reminds one of the sudden contraction of body which Hanuman made in his competition with Surasa to become as big as possible. With exquisite humour, the poet Valmiki paints in the *Ramayana* the facile way in which Hanuman bye-passed the problem of size with the aid of his yogic powers. With the aid of microphotography, the book appears to enter a new incarnation, contract its body from say 50 cubic inches to "fifteen by hundred" of a cubic inch, and thus by-pass the problem of space. Here are the various micro-forms which books have been given in recent years with the name of the countries where they are most prevalent.

Name	*Size*	*Reduction Ratio*	*Relation to light*	*Country*
Microfiche	125mm × 75 mm	1: 25	Transparent	Holland and Germany
Microfilm	35mm × 30 meters	1: 30	Transparent	U.S.A. & Great Britain
Micro-strips	35mm × 25 mm	1: 30	Transparent	France
Micro-Card	125mm × 75mm	1: 30	Opaque	United States

551 MICRO-CARD

In his *Scholar and the future of the research library* (1944) Fremont Ridar advocates the use of the back side of the catalogue card for the micro-reproduction of the entire book. This will be possible when the number of pages of the book does not exceed 150. In this arrangement there is no need at all for shelf space in a library ! Nothing can flout the Fifth Law better.

552 MICRO CARD READERS

The success of micro form of books depends largely upon improvement in the reading apparatus. Considerable research is proceeding in this matter. Further lowering of the reduction ratio and further increase in enlargement ratio are moving abreast of each other. It is expected that the cost also will be soon brought within the economic means of ordinary persons.

553 STANDARDISATION

In the *Micro copying supplement* No. 1 published in the *Unesco bulletin for libraries*, V.6, No. 2/3, February/March 1952, we find a tabular statement of the various processes, the camera and the readers now available in the market. It is obvious from this tabular statement that the time has come for standardisation to step in. We have stated in Chapter 3 that standardisation should not enter the province of art where the "individualing particularities" are of the very essence. A book, as we have it today, has a personality of its own. It lends itself for artistic treatment. But the micro film and micro card do not have any artistic appeal. They are impersonal. They can therefore be brought strictly under standardisation without any heaviness of heart. The ISO/TC/46 of the International Standards Organisation is applying its mind to their standardisation.

56 Excluded Materials

We must remember that the transformation of a book into the impersonal micro card and the insertion of the hurdle of magnification and readers will go against the Second and the Third Laws, in so far as the ordinary man is concerned. We have elaborated in Chapters 3 and 4 the great attention that should be paid to make books acceptable to the ordinary man. It therefore follows that none of the current books or periodicals or newspapers should be reduced to micro forms in ordinary libraries. These are prohibited materials.

57 Permitted Materials

On the other hand many of the older materials in the National Central Library can be reduced to micro form. These belong to a different cultural epoch. The common man will not be interested in them. It is only the learned few that will care for them. But their interest will be so intense that they will not feel frustrated by the hurdles of the micro form. It is true that certain books are immortals. Their value persists through all ages. These are the classics. But Social Bibliography will argue that such classics will appear in new editions from time to time. The older editions, again, will be of interest only to the scholar and seldom to the common man. Thus Social Bibliography will have no objection to the reduction of all the older books of a National Central Library to the micro form. These are the permitted materials.

571 PALAEO-BIBLIOGRAPHY

There is however one great danger in the reduction of the older materials to micro-form. The photographic process will not reproduce the watermark and many other features of the original which are so dear and so essential to Palaeo-Bibliographists. It is for Palaeo-Bibliography to fight this matter out with the Fifth Law. So far as Social Bibliography is concerned, as it has been already stated in Chapter 0, these scholarly details are of no interest to it.

572 INDIA

In my *Library book selection* (Indian Library Association, English series, 5) 1952, Section 51, a suggestion has been made about the utilisation of micro transformation of books in India. A division of function between the National Central Library and the State Central Libraries has been suggested in the form of the two following principles :—

1 The National Central Library to select the micro forms of books and particularly of periodical publications and newspapers ;
2 The State Central Libraries to select the ordinary forms of books.

573 ORDER OF PRIORITY

It is now too early to assert in these matters. All that we can now do is to establish a scale of priority for micro transformation. The position of any material in this scale will have to be determined by:

1 the degree of individual artistic feature which it has to have ;
2 the degree to which it lends itself to continuous reading ;
3 the frequency of its probable use ; and
4 the volume it occupies.

On the basis of these tests, we may perhaps arrange some classes of reading materials in the following order of decreasing preference for transformation into micro form.

1 Newspapers ;
2 Serials ;
3 Periodicals ;
4 Other forms of reference books ; and
5 Books which by their very nature go out of date rapidly, say books on medicine.

574 OTHER USES

Apart from meeting the crisis created by the Fifth Law, reduction of reading materials to micro form can serve other purposes in National Central Libraries as well as in academic and business libraries. Here are some of them :—

1. Filling up gaps in the collection of printed and manuscript materials ;
2. Restoration of materials whose paper is perishing ;
3. Unrestricted extension of inter-library co-operation in regard to kinds of materials, however rare, without the risk attendant on inter-library-loan, by the supply of micro copies ;
4. Possibility for libraries to supply free to scholars micro-copies of articles needed for their work. (It is found that this simplification in distribution gives full compensation for the small cost involved and that it adds enormously to convenience of the scholars) ;
5. Preservation of duplicates of the contents of National Central Libraries in micro-form in safe places, to meet emergencies which may arise out of war and other risks.

CHAPTER 6

PAPER-MAKING

Paper-making presents six factors with which the library profession should acquaint itself in order to make its own contribution to Social Bibliography. They are:—

1 The primary material out of which paper is made;
2 The half-stuff and pulp made from the raw material;
3 The transformation of pulp into paper;
4 Finishing and the secondary materials used in it;
5 Sizes of paper; and
6 Varieties of paper.

61 Primary Material

The carbohydrate cellulose, which vegetable organisms produce to build the "steel-frame" of their physical structure, is the primary substance needed to build the "steel-frame" of the physical structure of paper also. Man cannot synthesise the elements carbon and hydrogen in their native state to form cellulose. He has therefore to take cellulose from the vegetable kingdom. Practically all higher forms of plants and trees make cellulose. Some have it in a nearly pure condition. Others have it in various degrees of physical and chemical bondage with other organic substances, like lignin, pectin, and resin which bind the cellulose fibres together, make them water-proof and protect them in other ways. There may also be residue of the original contents of the cells. Durability of paper will decrease with the amount of chemical action needed to separate cellulose from other incrustations. We shall mention them in decreasing order of ease of exploitation :—

Sl. No.	*Plant*	*Part*	*Percentage if Cellulose*
1	Cotton	Seed hair	83
2	Sunn-hemp	Inner bark	66
3	Jute	Inner bark	58
4	Wood, pine, spruce, fir and other conifers	Stem	55
5	Linseed	Inner bark	50
6	Bamboo	Stem	46
7	Grass like esparto, munja and sabhai	Stem	35
8	Rice	Stem	35
9	Wheat	Stem	33
10	Sugarcane	Stem	33
11	Plantain	Stem	30
12	Bul-rush weed	Stem	29

Of the twelve kinds of helpers of the vegetable kingdom mentioned above, it is only cotton, wood, bamboo and grass which gives fibres suitable for printing-paper. Paper made from other fibres is fit for packing and other uses.

611 COTTON

Of the four sources mentioned in section 61 as useful for making printing paper, cotton fibre, which is the longest and purest, is all required for the manufacture of cloth. It can be had only in the form of industrial wastes and rags of worn-out clothes and cloth. The result is that the cotton fibre which is brought to use for paper-making would have accumulated other accretions like dirt, oil, greese, buttons, pins and so on. These will have to be removed. Even in the form of rag, the quantity of cotton fibre available has long ago lagged behind the needs of Social Bibliography. With all the tight and thorough rag from cities, villages and factories and the price offered for them in cash and kind, cotton cellulose has become too scarce to be used for any copies of books that need not be permanently reserved. Another practice induced by the scarcity of cellulose is that the copy-right copies of books intended for preservation for posterity are printed on rag-paper, while the copies for trade are printed on less lasting paper. The *Times* newspaper, for example, prints a special issue on all-rag or part-rag paper for preservation in national central libraries.

612 GRASS

Paper made of esparto grass gives a good smooth surface for picture magazines. The *Illustrated London news*, the *Graphic* and the *Sphere* are said to use esparto-paper. But grass that is suited for printing-paper is not in sufficient plenty. Therefore, it has to be used for paper for special purposes.

613 WOOD

The most plentiful natural product which has to be used for making paper is wood. In countries in temporate zones—the Scandinavian countries, for example—the coniferous trees promise unending supply. These trees in Kashmir can also be exploited. Other regions in the Himalayas are also plentiful. But they are too inaccessible to admit of economic exploitation. Social Bibliography therefore makes India to depend on bamboo for raw material. The Forest Research Institute at Dehra Dun owes a great responsibility to Social Bibliography. It should find out by experiments the best wood that can be had for paper-making and take steps for the perpetual growth of the trees selected as most suitable.

614 BROKE

Paper-waste formed at the time of paper-making or printing as well as printed paper in discarded books and newspapers can be ploughed back into the paper-mill. Such materials are called "broke". Broke is naturally weaker. In addition, printer's ink is not easily removable. Therefore paper made of broke is inferior in every way.

62 Half Stuff and Pulp

The conversion of the raw material into half-stuff involves the first five, and that into pulp, the addition of the last three of the following operations :-

1. Cleaning and Cutting
2. Boiling or Retting
3. Washing and Breaking
4. Bleaching
5. Purifying
6. Beating
7. Loading, sizing and colouring

621 CLEANING AND CUTTING

In the case of such raw materials as rags and grass, the first operation is to clean out any adventitious foreign matter, such as dust, metal pieces, clay-clots, roots, etc. In the case of wood, the trunks should be sawed up into lengths of about 2 ft. and debarked and the knots should be removed. Then only dusting, etc. will be done. After cleaning, rags and grasses are chopped into small pieces. Logs are cut into chips. In small scale work, only simple tools are used for these operations. In large scale manufacture, suitable machinery is employed.

622 BOILING OR RETTING

The cleaned chops or chips are next boiled or digested under pressure in an alkaline solution, usually of caustic soda or its mixture with sodium sulphide. The chemical function of the boiling process is to convert all the non-cellulose part into soluble compound and to split up the cellulose part more or less completely into its constituent fibres by dissolving out the cement holding them together. When caustic soda alone is used, the process is called Soda Process. If sodium sulphite also is mixed it is called Sulphate Process. A generic name of the two is Alkali Process. An alternative to the boiling process is the retting or Cold Process. In this the material is mixed with a paste of slaked lime in the proportion of 100 to 15 and kept overnight. Next day it is pounded lightly and kept in a heap. Water is sprinkled over it and the material is stirred from time to time. It is better that the heap is exposed to sun light. Retting will have to be repeated until the material is reduced to a homogeneous pulp. This is a slow process which takes one to three months. But the boiling process may not take more than eight hours. When the raw material is wood, bisulphite of lime is used instead of caustic soda. In this case it is called Sulphite or Acid Process. The pulp is known as sulphite wood pulp. In either case it is called Chemical Pulp. There is also a Chlorine Process.

623 WASHING AND BREAKING

After the material has been boiled, it is usual to give it a preliminary rough washing in the boiler itself. The caustic soda solution still remaining in the fibre has to be very thoroughly removed. This is necessary both for the fibre and in the interests of economy. It is also necessary to satisfy public Health Regulations like the Rivers' Polution Act. The process of washing takes a long time. After boiling, the fibre is apt to be formed into masses or clumps and has to be broken up and reduced to an aqueous mass of the required uniform consistency. In small scale work the washing is done in rivers and canals. The breaking is done by churning the material in a vessel containing water. In large scale manufacture washing and breaking is done by machinery. The essential part of it is the washing drum which consist of a series of paddle blades. Clean water is continuously added to the fibre inside the vat through a pipe situated at one end of the tank. The washing drum is rotated slowly and the dirty water is drained out at the same rate at which clean water is being added. This is done until the last trace of caustic soda or bisulphite is removed. The breaking of the clumps is done by rotating the drum faster. When the breaking is complete, the charge is drained off for bleaching through an outlet in the bottom of the vat.

624 BLEACHING

Two methods of bleaching are possible. Sun-bleaching and chemical-bleaching. In the former, the material is moistened with water and spread out on a stone cement floor or mats of close texture for some days. This is a slow process. It is not as efficient as chemical bleaching. But there is no chance for the cellulose to be harmed.

In chemical bleaching, the bleaching liquor is poured into the vat containing the broken material and the whole kept in circulation for the required length of time which may vary from 12 to 24 hours. Unless the engineer and the chemist co-operate in adjusting the strength of the bleaching liquor the rate of stirring and the time, the bleaching will not be uniform and the cellulose may be injured.

625 PURIFYING

When the bleaching process has been completed, the material is more or less white. Physically it is in a state of broken-up fibrous substance suspended in water, with impurities consisting of surplus bleaching liquor and other soluble and insoluble substances formed by the action of bleach. The quality of the paper depends upon the thoroughness of removing the impurities. If any residue of bleaching powder is left, it will in due course oxidise the cellulose and the paper will turn yellow and crumble away. Thus durable paper requires perfect purification of the material after bleaching is over. The purifying process consists of draining off of the dross liquid from the fibrous matter and the washing of the latter subsequently in clean water.

6251 Half-Stuff

In the form to which the cellulose has been brought by the above mentioned processes is called "half-stuff". When the raw material is rag, the half stuff is prepared by the paper maker himself at the very place where he makes paper. It usually has a concentration of 3 to 5%

6252 Chemical Pulp

When wood is the raw material, since 50% of it consists of non-cellulose matter, it is found to be economical to get the half-stuff made near the spot where the trees are felled. The water in the half-stuff is squeezed out until the moisture is reduced to 10%. In this state it is packed into bales and sent to the paper maker. This is called "chemical pulp".

6253 Mechanical Pulp

Mechanical wood pulp is nothing else than ground-up-wood. More than 50% of it is made of non-cellulose matter: The lignin, the pectin, the resin and all other substances of the original wood. The process employed in its preparation is simply to grind the prepared pieces of wood against a rapidly revolving sand stone. The grinding is carried out in the presence of water. The stuff is screened to remove the coarse material and formed into slabs. These contain 50% of water. These sheets are sent to the paper manufacturer in bales. This is called "mechanical pulp". Here we save the cost of boiling, washing, breaking, bleaching and purifying. But the quality of the paper made out of mechanical pulp is correspondingly poor. Its life is very short indeed. It is used only to print impermanent reading materials like newspapers. But people who do not understand this weakness in paper but are carried away by its cheapness, unfortunately use it to print books on. This is often happening in regard to books in Indian languages today. Mechanical pulp is resorted to just to reduce cost of books. There is no doubt that this is penny-wise and pound-foolish. Social Bibliography would warn the Indian public against the blindness involved in encouraging production of books on mechanical pulp paper.

626 BEATING

The process of beating is the most important one in the series of steps involved in the preparation of the pulp. It is even said, "Paper is made in the "Beater". By beating, the fibres are bruised and reduced into fragments of about five or six-hundredth of an inch in length. For this purpose the purified material is passed into the beating engine. The material is made to circulate between a bed plate and a drum both of which have knives. The sharpness or bluntness of the knife, the speed of the drum, the temperature at which the beating is carried out and the length of time for which it is conducted, determine the quality of the product. It requires a high degree of skill on the part of the beaterman. For good paper which has sufficient lightness, the material should be beaten slowly with dull knives allowing the fibres to assimilate water. The short fibres of grass and wood can be beaten in a shorter period than the long fibres of cotton. For thin paper more prolonged beating is necessary than for thick paper. The beating may require as much as eight hours in the case of cotton. In case where a blend of pulps made of cotton and of other materials is required, each constituent is separately beaten for the appropriate time and they are blended subsequently in a suitable machine.

627 LOADING, SIZING AND COLOURING

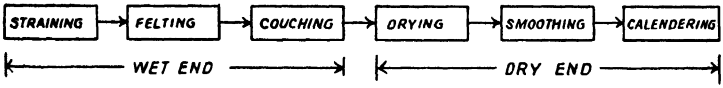
Nearly all classes of paper have to be treated with certain substances before they are fit for writing or printing. Two kinds of materials at least must be incorporated in it. In the first place the interstices between the fibres must be filled up with some mineral matter such as calcium, sulphate or China clay. Secondly the paper must be sized so as to convert it from something absorbant like blotting paper to something that will not absorb printing or writing ink. In certain cases it may even be necessary to add some colouring matter. It is customary to add the loading, sizing and colouring material to the pulp during the beating operations.

63 **Paper Making**

The convertion of the pulp into paper can be made by hand as well as machinery. Both the methods are schematically similar. They involve the following operations:—

1 Straining
2 Felting
3 Couching
4 Drying
5 Smoothing
6 Calendering

SCHEMETIC DIAGRAM



631 HAND-MADE PAPER

6310 Hand-Mould

The basic tool in making paper by hand is the Mould. The mould is a shallow sieve set in a rectangular wooden frame-work. The sieve, or mould-cover as it is called, is a bamboo mat. It is made by placing thin strips of rounded bamboo side by side—about twenty strips to an inch. They are laced together with horse hair at regular intervals of between 1″ and 2″. The mat may also be of grass or wire. The width of the interval between the parallel strips is too small for fibres to pass through, but sufficient for water to drip down. Such a mould is called a "laid-mould". The mat is flush with the frame. A second, but open, frame called a "deckle" fits on to the first and forms the raised edges of the mould. The object of it is to hold the pulp in. It is loose

6317

and removable. With the deckle on, the mould is virtually a shallow tray.

631 STRAINING

The pulp is diluted with water to a consistency of about 2%—say like gruel. It is run from the storage chests through a screen which keeps out any foreign material or any of the fibres which may not have been sufficiently reduced in size. Then it is passed into a vat.

6312 Felling

The tray formed by the mould, frame and deckle is dipped by the Vatman into the pulp and is withdrawn with just that amount of pulp on it that will give the required thickness of paper. As the water of the pulp drains through the mat, the vatman shakes the mould laterally and causes the fibres to felt together at all angles to one another. The strength of the paper depends on this shaking. It is a very delicate and subtle craft and nothing but the human hand can do it.

6313 Couching

When the water is fully drained away, the deckle is removed and the mould passed across to a second workman known as the Coucher. He couches (transfers) the wet sheet of paper on to a piece of felt of about equal size. He then places another piece of felt over it. By the time he completes it, the vatman hands over to him a second mould and takes away the old empty mould for further use. When a pile of such moulds and sheets has been accumulated, it is transferred to a press where the surplus water is squeezed out and the paper compressed and closed up.

6314 Deckle Edge

The lapping of the liquid pulp against the sides of the deckle causes the sheet of paper to have a rough and wavy edge, which uncut books have. Such an edge of hand-made paper is called "deckle edge".

6315 Water-Leaf

After the water is squeezed out from the pile, the felts are removed. The sheets by themselves are pressed to remove all irregularities. They are then hung in a loft to dry. When dried it is still called "Water-leaf" because it will readily absorb water. It must be stated in this connection that when paper is made by hand the size which makes paper waterproof is not added at the beating stage. It is added only after the paper is formed. The sizing is accomplished by dipping the dry sheets into tubs containing the size.

6316 Calendaring

The paper is again air-dried. It is then glazed or "calendered". This is done by passing a pile of sheets each separated by a copper polished plate through a heavy board of rolls. The object of calendering is to make the surface of the paper more or less highly polished and smooth. The greater the pressure applied and the more thoroughly the rolling is carried out, the higher will be the polish. The surface may be further improved by heating the metal plates. Calendering not only glazes the paper but also compresses it to very nearly to a half of its thickness. This increases its tensile strength. However, if calendering is overdone it bruises and breaks the sheet of paper. At any rate it will make it brittle and liable to crack when handled.

Uncalendered paper has a rough surface and might rightly be taken at first sight for a piece of fine blotting paper. It actually has some "blotting" power. On the one side it appears fibrous even to the unaided eye. On the other side it shows the pattern of the mould on which it was formed. The calendered material does not show the individual fibres and is almost identical on both sides. It is easy to write with a pencil on the uncalendered paper. But on the calendered one, the pencil grips the harder surface with difficulty.

The degree to which calendering is carried out is varied with the requirement of the paper used. For many purposes what is known as "machine-finished" paper is sufficient. Here the calendering is confined only to a very few calenders. When a higher finish is sought super-calenders are used. These are larger and heavier. It is found that if the paper is slightly damped before it is passed through super-calenders, the finish on its surface is greatly improved.

6317 Water-Mark

It is usual to attach to the mat of the mould the design of the paper maker, made in twisted wire. The result of this is that finished paper shows the impression of the lines of the design whiter and more transparent than the rest of it, when held up to the light. This is the "water-mark". This is of the greatest importance in collating books in palaeo-bibliography.

6318 Laid Paper and Wove Paper

In the same way in which the water mark is formed on paper, the lines of the strips in the mould will also produce their impression on the wet pulp. Paper made with "laid-mould" is therefore called "laid-paper". Laid paper will also show "chain lines" which are the impressions of the horse hair used to tie together the strips in the mould. When woven wire-mat is used, laid-mould is replaced by a "wove-mould". The wove-mould also will show similarly a faint net-work of diamonds. Such a paper is called "wove-paper".

632 MACHINE-MADE PAPER

When paper is made by machine, practically all the stages mentioned in the making of paper by hand are gone through. The only difference is that making by hand is a slow process—not more than 300 sheets being done by a single person in one day. But as it has been already stated in section 16, a machine can make about 25 miles of paper per hour. The well-known British Paper Machine is called the Fourdrinier Machine, as already stated in section 16. It is a very elaborate machine. The machine takes the diluted pulp at one end and delivers finished paper at the other. The first end is called "wet-end" and the second end is called the "dry-end". The work indicated in stages 1 to 3 mentioned in section

63 belong to the wet-end. The remaining stages 4 to 6 belong to the dry-end. The schematic diagram shown in section 63 represents also the process of making by machine.

633 STRAINING

The pulp, as it is delivered from the beating engine, is diluted with water to a consistency of about 1%. It is first caused to float through a sand trap. This trap is sinuous. The pulp flows over small ridges provided across the channel. Any large-size pieces of sand or dirt which flow in with the pulp are kept back by this trap. The pulp then passes on to a strainer consisting essentially of a plate in which many narrow slits have been cut. Only properly pulped fibres come through it. The pulp then passes through a sluice which regulates the quantity of pulp in accordance with the thickness of the paper to be made.

634 BREAST BOX AND FELTING

The pulp passes through the sluice into a breast-box. From there it passes on to an endless travelling band of wire-cloth. As the stuff is carried forward on this moving wire cloth, much of its water drains away through the interstices. As the wire is being continuously shaken laterally, the fibres felt together. In this case it is not at all angles as in the case of hand-made paper. It is only across the width of the mould. A result of this is that machine-made paper will tear more easily in one direction than along a direction perpendicular to it. The width of the finished paper is settled by means of "deckle strips" made of India rubber. These are also endless bands which travel with the wire-cloth.

635 COUCHING

Near the dry-end the wire-cloth passes over two vacuum boxes connected to a suction pump. Thereby the wet-sheet is still further freed from water. At this stage the sheet is soft enough to receive any required water mark. This is effected by means of a "dandy-roll" placed between the vacuum boxes. Dandy-roll is a light cylinder bearing on its surface the required design in raised wire. It presses gently on the wet paper and thins it very slightly beneath the wire pattern. The wire-cloth with the wet sheet then passes through a battery of "couch rolls" covered with felt. The wire-cloth is then turned round the lower couch roll and laid back towards the breast. The wet end terminates here and the dry end begins.

636 PRESSING

On the other hand the paper sheet, which has by now well formed to move forward independently, passes forward off the wire. It is carried through a series of "press rolls". At the end of this phase, the paper becomes free from all loose water and has been consolidated into a strong sheet.

637 DRYING

The paper is however still moist and has to be thoroughly dried. For this purpose it is passed round a series of steam-heated drying cylinders.

638 CALENDERING

Thereafter the paper passes through the rolls of a calender and gets smoothened, polished, consolidated, reduced in thickness and increased in strength. As the sheet leaves the calender, it gets wound on to a reel. Super-calendering is not usually done at the dry-end of the Fourdrinier Machine. It is done in a different part of the paper mill.

64 Finishing

In the making of paper, the finishing may consist of the following processes :—

1 Tinting
2 Loading
3 Sizing
4 Calendering
5 Cutting

The first three processes are usually done at the beating stage. In certain cases sizing is done at the finishing stage. In one class of paper *viz.* art paper, coating instead of loading is done at the finishing stage. It is often done as a separate process. The other two processes have necessarily to be done at the very last stage.

641 TINTING

Practically every kind of paper, except a very few varieties, is required to be tinted to some degree. Even the so-called white paper is not an exception. For paper made from bleached white pulp is yellowish and has to be toned with the addition of some colouring matter, in order to produce white effect in the paper. For tinting hand-made paper, smelt (=very finely powdered glass coloured with cobalt) is used. This is permanent and non-injurious. For all-rag, machine-made and all other good quality paper, ultramarine (=azure blue) is used. This also is permanent if the paper is not exposed to acid fumes. For cheap paper like newsprint cheap light-fugitive methyl and ethyl colours are used. The colouring materials, other than smelts, are sensitive to acid. When they are used, all traces of bleaching powder, used while beating, should be washed out thoroughly before tinting material is put into the pulp. For this reason it is put only at the last stages of beating the half-stuff.

642 LOADING

To make the paper opaque, it must be loaded with a suitable mineral substance. Hand made paper is seldom loaded. In all other paper 2 to 10 % of loading is common. The loading material is usually an admixture of China clay, which is made to occupy the interstices between the fibres.

6421 Imitation Art Paper

Super-loading amounting to 24 to 30 % of the total weight of the paper is used in making "imitation art paper". The primary material is usually esparto and sulphite wood. The former being four to nine times the amount of the latter. This was first introduced by Thomas Routlege to print the popular illustrated weeklies. This paper is made, dried and calendered in the usual way. The calendering is done with the surface of the paper damp. It closely resembles "art paper" which is described in the next section. But it is cheaper. As it is weak paper it cannot be used for permanent record.

6422 Art Paper and Coating

Genuine "Art paper" is finished and dried paper coated with china clay or "satin white" (=a compound of aluminium sulphate and lime). An adhesive such as glue or casein is added to the coating solution. Paper may be coated on one or both sides. But the coating is confined to the service. It does not saturate the paper as in imitation art paper. In printing, the type or block is confined only to the coat of mineral matter. The ink does not penetrate into the fibrous part of the paper. The fibrous part therefore merely serves as carrier. Therefore it is sometimes of very poor quality. Art paper is unpleasant to handle although at the first touch the soft feel may be agreeable. Art paper is however a necessity nowadays to take advantage of the art of half tone illustrations.

643 SIZING

There are four groups of materials which can be used in preparing the size: (1) Starch, (2) Glue, (3) Rosin and (4) Casein. For hand-made paper and for the best quality of machine-made paper the size used consists of gelatine and alum. As gelatine is of animal origin this mode of sizing is called "animal-sizing". In all other kinds of paper the size used is rosin and alum. Rosin is a residue of turpentine distillation. It is therefore slightly acidic. It should not be applied before the cutting process is at least two thirds of the way through. Unless great care is taken, contact of this with the residual alkali in the pulp may produce globules of salt. These globules will cause specks in the finished paper, When the size is applied at the beating stage, it is called "engine-sizing". If it is applied by dipping each sheet of dry paper into a tub containing the size, it is called "tub-sizing". If paper is made by machinery and tub-sizing is wanted, the sizing tub is set between two stacks of drying cylinders. Rosin admits only of engine sizing.

Writing paper requires harder sizing than printing paper. The degree of sizing can be smaller when the pulp is beaten with blunt knives than when it is freely beaten. Generally thick paper requires less of sizing than thin ones.

Paper sized with starch attracts rats, silver fishes, worm and other insects. Gelatine size is preferable for paper intended to last long. Paper with rosin size is not durable.

644 CALEDNERING

An account of calendering and super-calendering and of the need for it had already been given in sections 6316 and 638.

645 CUTTING

When paper is made by hand the sheets are sold without cutting. This is because the size of the paper is comparatively small. But when paper is made by machinery, it is made in a continuous sheet of a length of four or five miles. But the width is limited by the distance between the deckle traps. It is found more economical to adjust this distance for making the width of the paper a multiple of the width finally required than to adjusting for the finished width straightaway on the machine. For it takes practically the same amount of power and the same attendance-charges to work the machine, whatever be the width. Therefore in practice the width of the paper as it leaves the machine is several times the width in which it is marketed. Before marketing, the paper is slit to the desired width.

Printers, who use rotary machine, prefer to have the paper in rolls. But others want it in the form of sheets. To meet the latter demand, the web is usually cut by machine to the required size.

65 Sizes

More than 240 different sizes of paper are now being produced. In the older countries the sizes of sheets have different trade names. The table on page 246 shows the different conventional sizes and their measurements.

651 FORMAT

"Format" is the name given to the shape and size of the book. It is determined by the size of the whole sheet and the number of times it is folded to form leaves and pages.

The open sheet is often used for printing maps, proclamations, etc. It is then called "broad-side" or "open-sheet-folio". A broad-side gives two pages.

If the sheet is folded once, we get a pair of leaves or four pages. This is called "folio". The folding is done along a line midway between the two shorter sides of the sheet.

If the sheet is folded twice, we get four leaves or eight pages. This is called "quarto".

If the sheet is folded thrice, we get eight leaves or sixteen pages. This is called "octavo".

Trade Name	*Size of Sheet in inches*	*Size of Octavo in inches*	*Note*
1 Pott	15½ × 12½		Name taken from a water mark emblem of a pot.
2 Foolscap	17 × 13½	6¾ × 4¼	Name taken from ancient water marks of a court gesture
Double foolscap	17 × 27		
3 Crown	20 × 15	7½ × 5	Name taken from ancient water mark emblem of a crown
Double crown	20 × 30		
Quadruple crown	4 × 30		
4 Demy	22½ × 17½	8¾ × 5⅝	The term 'demy' is from the French term 'demi', half.
Double demy	22½ × 35		
Quadruple demy	45 × 35		
5 Royal	25 × 20	10 × 6¼	Named from the water mark of an ornamental shield surmounted by a fleur-de-lis
Large Royal	27 × 20	10 × 6¾	
6 Imperial	30 × 22	11 × 7½	
Double Imperial	30 × 44		
7 Atlas	34 × 26	13 × 8½	
8 Antiquarian	53 × 31	15* × 13⅓	

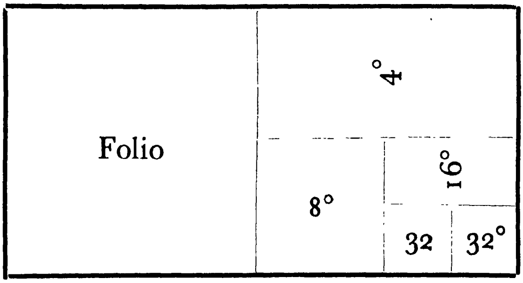
To this may be added the following two sizes in which hand-made paper is made in India:

1 Shahiste Khani	28 × 21	10½ × 7
2 Bahadur Khani	38 × 31	15½ × 9½.

Just as we have "double" sizes, we can also have quadruple or "quad" sizes.

Generally if the sheet is folded *n* times we get 2^{n+1} leaves and 2^{n+2} pages.

Each fold halves the area of the page and alters the measurement in one direction only. The following diagram is a representation of the result.



The above is the regular sub-division of a sheet. It is possible to have alternative forms. These are called irregular sub-divisions. But normally regular sub-divisions alone are used for books.

It can be easily seen that in the folio, the chain-lines will run parallel to the longer side of the sheet. In a quarto they will run parallel to the shorter side of the sheet, in the octavo parallel to the longer side of the sheet and so on. The water-mark also will shift its position among the leaves with each folding.

A folded sheet is called a " section ".

66 Varieties of Paper

It is said that there are about 2,000 varieties of paper in the market today. The varieties arise from various causes. The primary raw material used is one of them. We have seen that the cellulose may be drawn from cotton, hemp and flax, grasses of various qualities, and bamboo and wood of various qualities. Secondly the process of extracting pure cellulose may be varied by difference in the chemicals used for digestion and the speed of digestion. Varieties may also be caused at the beating stage both by the bluntness of the knives and the speed of beating. Again various varieties can be caused by the chemical nature of the subsidiary materials used for tinting, sizing and loading or coating. Varieties can also be produced at the felting stage both by difference in speed and that of shaking. Lastly varieties are also caused in the pressing and the calendering stages. Pleasing appearance, strength and durability vary with the different varieties. I saw a feast of paper varieties in the Hunter Museum of Paper in the Massachusetts Institute of Technology, collected by Dard Hunter, during a life time devoted to the work.

661 LIBRARY PROFESSION

By far the greatest portion of paper made is used for printing. Enormous quantities of paper are stored in the shelves of libraries as books, periodicals and newspapers. It is in the library that paper is handled without necessarily destroying it in the process. It is again there that it has to be preserved longer in spite of frequent handling. Beyond all that, the lasting beneficial social use to which paper is put is in the library. It is therefore but proper that the library profession should take part in the improvement and maintenance of the standard of paper used for printing books.

662 CALL OF SOCIAL BIBLIOGRAPHY

This is a call of Social Bibliography to the library profession. This call has not been unheeded to. Between 1885 and 1896 the Government of Germany set up extensive researches on paper used for printing. In 1898 the Royal Society of Arts of Great Britain set up a Committee to investigate the subject. Its findings were published in the *Deterioration of paper* (1898). The investigations made in the United States of America between 1904 and 1909 were summarised by the Department of Agriculture in *Durability and economy in papers for permanent record* (1909), which formed report 89 of the Department. In 1913 the Book Production Committee of the British Library Association turned a chapter of its *Interim report* on paper. In 1928 the International Committee of Intellectual Co-operation drew the attention of the governments of participating countries to the problem of paper. In the same year the British Library Association appointed a Committee of Experts by the following resolutions:—

"The Library Association, agreeing that the present position as regards deterioration of documents and printed matter in Public Record Offices and Libraries threatens to become extremely grave and that practical steps might be taken without serious difficulty to remedy this situation, hereby expresses its emphatic approval of the resolutions and recommendations of the Committee of Experts approved by the International Committee on

Intellectual Co-operation at Geneva, August, 1928, namely :—

> 'That the attention of Governments should be drawn to the necessity of using for documents (and printed matter) of permanent value, and especially for those of an official character only papers manufactured according to (given) specifications.'

In support of the foregoing it is further resolved :—

1 That H.M. Government be petitioned to consider the establishment by H.M. Stationery Office of standards of durability for papers and other writing materials to be used for public documents of permanent importance.

2 That the Paper Makers' Association be requested to consider the establishment, either in conjunction with H.M. Stationery Office or independently, of a public testing station, in order to fix similar standards for commercial use, and to publish the results of investigation into the subject. That the Publishers' Association be requested to confer with the Library Association (*a*) as to the possibility of issuing on papers of approved durability copies of books for subscription by public, university and other libraries ; and also (*b*) as to the terms on which a statute

> might be framed so as to ensure, without hardship to the book trade, the printing on such papers of those copies of books and other publications destined for preservation in the copyright libraries."

Its report entitled *Durability of paper* (1930) was published as a supplement to the December issue of the *Library association record*, ns 8. Robert P. Walton has given a bibliography on the subject in his *Causes of prevention of deterioration in book materials* (1929).

663 RECOMMENDATIONS OF THE BRITISH COMMITTEE

The British Committee had set up some standards. They may be summarised as follows:—

Grade I (*a*). All-rags. Hand-made. Tub-sized. Only white, cream or unbleached linen or cotton rags of best quality ("firsts"), raw cotton or flax or other pure cellulose to be used. The pulp to be well washed to free it from bleaching residue. The least possible amount of alum is to be used consistent with a fairly hard sizing suitable for a printing surface. No mineral matter to be added as loading. Iron salt, if present at all, should be present only in minute traces.

To be used for permanent archival material.

Grade I (*b*). All-rags. Machine-made. Tub-sized or Engine-sized.

To be used as alternative to Grade I (*a*).

Grade 2. All-chemical-wood. Machine-made. Engine-sized. The pulp to be well-washed to free it from bleach residues. The ash content to be not more than 5%. Least possible amount of alum consistent with a fairly hard sizing suitable for a printing surface. Rosin content not to be more than 2%. Mineral matter added as loading not to exceed 6%. Iron salts, if present at all, to be only in minute traces.

To be used for books and printed matter that are to have as long a life as possible without the use of costly raw materials being involved. Copies of books intended for copyright libraries to be on Grade 2.

The Committee also estimated that the proportion of price of books on Grade I (*a*), Grade I (*b*) and Grade 2 will be as 6 to 3 to 1.

664 OBJECTIONABLE QUALITY

6641 Mechanical Pulp Paper

Mechanical wood pulp should not be used except for ephemeral books and periodicals.

6642 Feather-weight Paper

A more deceptive kind of paper is the one known as "antique" or "feather-weight". It is so called as it is bulky and light. It has a high percentage of esparto which is beaten off very quickly. It is machine-made. It is not well-pressed. There is little or no calendering. Chemically there is nothing wrong in this paper. The fault is all physical. The texture is loose. The leaves are therefore liable to "fluff". It is easily frayed during handling. Its fragments scatter when cut open with a paper knife. It accumulates dirt very easily. It does not take sewing. Its bulk is deceptive. It misleads readers about the number of pages in a book. It occupies 40% more space than one printed on Grade 2 paper.

665 ART PAPER

Another weak paper is art paper which has been described already in section 6422. As it is largely made of clay, its sheets stick up if exposed to damp. Folding cracks the coated surface. It does not take sewing. It is a necessary evil. The smoothness of its surface is necessary to reproduce sharply the excessively shallow relief of half-tone blocks. If the screen is more than 120 lines to the inch, even esparto paper does not print well. But screens of 175 lines are commonly used, while screens of 250 lines are not unusual. New modes of printing like the off-set process are rendering a glossy surface like that of art paper unnecessary even for fine illustrations.

666 INDIA PAPER

This is all-rag paper with moderate loading. It is well pressed. It is very thin but very strong. It makes a book only one third as thick as an ordinary paper. It is not suitable for public library use since the leaves are apt to get folded and crumpled. They are also apt to stick together.

India paper has little to do with India. In this term " India " stands for " Asia ". The Japanese make fine strong paper with a creamy, tint and a delicate and smooth surface which is admirably suited to print engravings. The Chinese too make very thin paper with a silky finish. They are also beautifully suited for the reproduction of wood-cut. This class of paper was first brought to England in 1842. With light loading and calendering it proved to be a strong paper. It was used by the Clarendon Press. On account of its Asian origin, it was christened " India Paper ".

67 India

H.G. Wells said: " Paper made the Renascence possible." In this he voiced a fundamental truth of Social Bibliography. By the use of capital R, Wells meant the European renascence of five centuries ago. This statement is retrospective. It describes what had happened—perhaps without planning. Social Bibliography's message to India is, " Learn from the past of others. You are now in the rising tide of renascence. You have to carry your vast masses on the top of that tide. You want paper for it. You want paper of the right sort. You should ask your civil authorities to collect fibrous wastes from all parts of the country. You should ask your Forest Utilisation Officers to explore the fibrous raw materials which can be used for paper. You should ask your chemists to find the cheapest and the most harmless method of digesting the fibres. You should ask them also to find out the least harmful secondary materials needed for paper making. You should ask your engineers to start with paper making machinery now current in the world and improve upon it." The Paper Research Department of the Forest Research Institute, Dehra Dun, has a great piece of work to do to make Indian Renascence effective. The industrialists should agree to conform to the best known standards in making paper. The Indian library profession should no longer think that the books which they have to serve drop like manna from heaven. It should exert itself to get printing-paper made in the right way and with the right quality to make it an effective vehicle for communication of thought among the classes as well as the masses. The Indian Standards Institution should bring all the above interests together and evolve a few agreed standards in regard to quality and prescribe authoritative water marks to show the standard of the paper. They should also simplify the number of sizes in which printing paper is produced. Reduction in the number of standards is always conducive to economy. If the number of approved sizes of paper does not exceed two or three, there will be considerable elimination of waste of space in shelving. We can indeed have compact shelving without making it chaotic when viewed from the angle of subject approach.

68 Librarian

A knowledge of paper making, an understanding of the physical and chemical qualities of paper, and familiarity with the defects of the different varieties of paper will stand a librarian in good stead in doing his daily work.

681 BOOK SELECTION

First there are some " Dont's ". Don't buy an edition in feather-weight paper. Don't be carried away by its bulk. Don't buy an edition in India paper however handy it may be for private use. Don't buy an edition in art paper. Don't buy costly editions in all-rags paper for books which are of temporary value. Then comes some positive hints for the National Librarian. Pursuade the book trade to produce the copyright deposit copies in at least Grade 2 paper. Pursuade newspaper offices to print a few copies in Grade 2 paper for preservation for future use. Pursuade the Parliament to introduce the necessary clause in the Copyright Act to secure these ends.

682 ACCESSION

While receiving ordered books and accessioning, familiarity with qualities of different varieties of paper will be of help in deciding whether the copy supplied is on paper which was specified at the time of ordering. The accession section should always make it a point to cut open the pages. As the fibres run continuously from one side of the fold to another, if pages are not cut open with a sharp edge it may tear into the margin or flake. If the cutting open is left to the reader, he is likely to use his fingers or his pen for the purpose. This will injure the page.

683 LIBRARY CIVICS

By suggestion and example, train readers in handling books in the right way. When suitable opportunities occur, bring home to the minds of readers, the physical frailty of paper. Make them realise the need for clean hand while touching books. Make them turn the pages without the help of their saliva. Dissuade them from folding the corners of leaves to mark pages. Provide a book mark in each book.

684 MAINTENANCE

As paper is the foundation on which the whole structure of books rests, the importance of its care in handling should be realised by the maintenance section of the library. The stack room should be light and airy and not the dark and dismal dungeon as it often is. The temperature should be constant corresponding to 65% moisture saturation of air, which approximates to 6% moisture contained in most papers. This indicates air-conditioning. If this is not possible, some help can be got by putting buckets of coal or trays of lime or any other water absorbant in various parts of the stack room. This is necessary because paper picks up water from the atmosphere and changes its shape according to the humidity it absorbs. Special papers will need to have more than ordinary care. Dampness is fatal to books in which art paper is used. When the atmosphere becomes dry, paper loses some of this water and again shape alters. As paper is a carbohydrate, certain insects would seek to live on the pulp. This is a great danger in tropical countries where insects are prolific. Frequent cleaning and dusting is the most effective remedy. Of course in an open access library insects will withdraw themselves from regions which are frequently disturbed by readers. But in sections which are not popular the cleaning will have to be done very frequently.

CHAPTER 7

PRINTING

Printing is the process of making many copies of a design which may consist of words, pictures or any graphical matter or any combination of them. It presents six factors with which the library profession should acquaint itself in order to make its own contribution to Social Bibliography. They are :—

1 Typography ;
2 Composition ;
3 Imposition ;
4 Printing ;
5 Illustrations ; and
6 Casing.

71 Typography

The first step in printing is to get the types. The type is made of an alloy of lead, antimony and tin, with a small amount of copper in some cases. It is called Type-Metal. The type is the end-product of a series of operations. The first is done by the artist. He draws the letter on a large scale—nine or ten inches in depth. A reduced negative of it is made photographically. The photograph is printed down on a brass plate. This is placed on a machine called Pantograph. Whatever motion is made at the lower end of the machine is reproduced at the upper end, movement for movement, in an identical manner but on a vastly reduced scale to any proportion to which we adjust the machine. The Punch is cut on a steel piece carried by the upper end. On the punch the letter is cut in relief in the reverse. We shall call it the negative. The punch is then hardened, justified and trimmed. It is used to stamp the Matrix into a piece of copper. The matrix is then fixed in a type-body. The matrix is positive. From the matrix the type is cast. The type is negative. Of course the print will be positive.

711 TYPE FAMILY

Members of a " type family " have the same general appearance. There are seven different groups, each group having several families within it. The outstanding difference in the groups is the shape of the Serif, which is a small finishing stroke at the ends of the main stems of the letters.

712 STYLE OF FACE

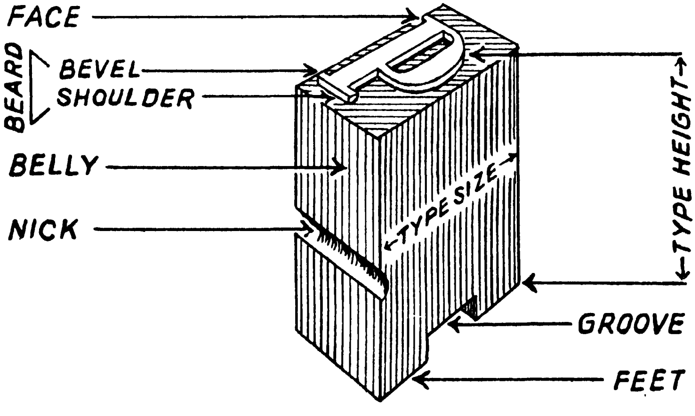
A type family may admit of several " styles of face." Roman, Bold, Italics and Condensed are oft-recurring styles.

713 PARTS OF A TYPE

The accompanying diagram shows the parts of a type. The body height of all types is the same—about nine-tenths of an inch—so that the faces will stand up in relief and take the ink, make an even surface and give a consistent impression on the paper. Four main parts may be recognised:

1 The Face ;
2 The Beard ;
3 The Body ; and
4 The Feet

The " face " is the entire printing surface. The " beard " is the space from the bottom of the letter to the front of the body. The "body" is also called "shank" or "stem". It is precisely rectangular in section. This admits of types being set side by side and tied together rigidly. It consists of: (1) Belly, (2) Back, (3) Sides and (4) Nick. The "belly" is the front of the type and parallel with the "back". The distance between the two is "type size". The distance between the "sides" varies according to the width of the letter. It is called the "set-measure". The "nick" is a grove or a set of groves across the belly. Each size in a point has a distinguishing form of nick. This is of vital importance to the compositor. The "feet" are the two projections at the base of the body and between them is the "grove".



TYPE

714 TYPE SIZE

The unit used to measure type size is $\frac{1}{72}$ of an inch. It is called a "point". Formerly different type sizes had different conventional names. The following table indicates the common sizes of types with their conventional names and type size in points. The conventional names are printed in the appropriate type size.

Modern Name	*Conventional Name*
5 points	Pearl
6 points	Nonpareil
7 points	Minion
8 points	Brevier
9 points	Bourgeois
10 points	Long Primer
11 points	Small Pica
12 points	Pica
14 points	English
18 points	Great Primer
22 points	Double Pica
24 points	Two-line Pica
28 points	Two-line English
48 points	Canon

The " set measure " will vary with the letter. It will be least in the letter " i ". It is the maximum and equal to type-size in " M ". Therefore, " em" is the term used to denote type-size when it is used as the unit to measure length of a composed line. The heights of all types are equal and .918 of an inch.

715 TYPE SERIES

Types of various sizes available for any one member of a type family is called a " type series ".

716 FONT

The assortment of types of any one style of face, family and size is called a " fount " or " font ".

717 AUXILIARIES

Auxiliaries, which go with types, are:

1 Punctuation marks;
2 " Spaces " or materials of less than type-height used for providing space between words; and
3 " Leads " of less than type-height used for providing space between lines.

The unit of measurement for the thickness of spaces is an " em ", which is equal to the size of the type. ' Hair space " is 8 to 12 to the em. " Thin space " is 5 to the em, " medium space " is 4 to the em and " thick space " is 3 to the em. A " quad " is a piece of metal similar to spaces, but much broader so that about half a dozen will fill an ordinary line. A square space *i.e.*, a space whose thickness is an em. It is called " em-quad ". Leads are chiefly made in four thickness, 1, 1½, 2 and 3 ems respectively. The thicker leads are made of brass and the thicker ones of wood. Leads are available in lengths of 18″ or 36″.

718 CASE

Types are contained in two large trays resting at an angle, one behind and above the other mounted on a frame. Each of these trays is called a " case ". The trays are divided into numerous small receptacles. Each of these boxes contains a different letter. Every small letter of the alphabet, spaces and lines are contained in the lower case. That is why the small letter is called " lower case ". The capitals and figures of numbers are contained in the upper cases. The capitals are arranged in the alphabetical order. The small letters are arranged in a manner similar to that employed in the typewriter key board, *i.e.*, letters required most often are placed close to one another, in a position from where they can be easily picked out.

72 Composition

Composition is the setting up or the assembling of the types as for the text. The publisher and the printer settle the " lay out " of the book *i.e.*, type or types to be used, the number of lines in a page, whether leaded or solid, the length of the lines and so forth. " Compositor " is one who composes types. He does the composition in a small shallow tray with a handle holding about 11 or 12 lines of twelve point types. It is called a " stick ". It is provided with a cross strip which is screwed to the required length of line before composition begins. The compositor holds the stick in his left hand, picks out the types one at a time with his right hand and inserts them in the stick beginning from the left side. He does not use his eyes in picking out the types nor in putting the type in the right way. By feeling with his fingures, he puts the type with the nick away from him. He does it very fast. One can scarcely follow the movements of his hand. In fact he composes over a thousand letters per hour.

721 JUSTIFICATION

As setting proceeds the compositor puts thick spaces between words. Type lines must be spaced fully out so that the printed matter shall end evenly. Therefore the compositor has invariably to decide when approaching the end of the line whether to increase the spacing between the words or to decrease the spacing in order to get the last word in or to divide the word. Real skill is needed to space the line so that the spacing shall *appear* equal between the printed words. This is called "justification". Ends of paragraphs are filled up by long spaces.

722 LEADING

Leads of approved thickness are inserted between lines. When lines are not separated by leads the matter is said to be set "solid". Types are also specially cast, on a larger body, so that the effect of leading is obtained without inserting leads.

This is hand-composition.

723 GALLEY PROOF

As soon as the stick is nearly full, the compositor slides the lines off it on to a larger tray called "galley". A galley is an iron tray which normally holds three octavo pages. The standing type arranged in a galley is called "matter". The matter is secured and a proof taken or pulled on a hand-press kept for the purpose. The proofs are read by "readers". After the corrections by the readers are carried out, a clean proof goes to the author. The author should make all his corrections at the galley stage.

7231 Proof Correction

The following table indicates the commoner symbols used in proof correction.

Marginal mark	*Meaning*	*Marks in the text*
	Insert omitted portion of copy	Caret mark in the required position
	Insert full point	,, ,,
	Insert comma	,, ,,
	Insert colon	,, ,,
	Insert semicolon	,, ,,
	Insert hyphen	,, ,,
	Insert interrogation mark	,, ,,
	Insert one-em rule	,, ,,
	Insert exclamation mark	,, ,,
	Insert apostrophe	,, ,,
	Insert superior figure	,, ,,
	Insert inferior figure	,, ,,
	Insert quotation marks	,, ,,
	Insert a three-dot leader	,, ,,
	Insert a slant stroke	,, ,,
	Insert square brackets	,, ,,
	Insert circular brackets	,, ,,
	Insert space	,, ,,
	Change to capital letters	Three lines under the letters or the words to be altered

Change to small capitals	Two lines under the letters or the words to be altered
Use capital letters for initial letters and small capitals for remainder of words	Three lines under the initial letters and two lines under the remainder of the words
Change to lower case	Encircling the letters to be changed
Change to black face	Wavy line under the letters or the words to be altered
Change to italics	Line under the letters or the words to be altered
Change to roman type	Encircling the words to be altered
Wrong fount—replace by letter of correct fount	Encircling the letter to be altered
Inverted type	,, ,,
Broken letter—replace by undamaged character	,, ,,
Make spacing equal	between words
Reduce space	between words
Transpose the order of letters or words	between letters or words (numbering when necessary)
Indent one em	

Correct the vertical alignment	As marginal mark
Straighten lines	As marginal mark, drawn through lines to be straightened
Delete (take out)	Striking through words or letters to be taken out
Delete and close up	Striking through and place above and below words or letters to be taken out
Leave as printed	Dots under the letters or the words which are to remain

724 Linotype Composition

The linotype is a machine which composes one line at a time. It has a key board resembling that of a typewriter. There are twenty (or more for some letters) matrices of every letter contained one behind the other in narrow channels, one channel for each letter. The set of channels is called "magazine" When the key board is pressed, one of the corresponding matrices is lifted up and brought into position in the line. When the line is finished, the operator presses a lever and the line is automatically carried away and is brought in front of a mould which is a rectangular steel aperture and a quantity of molten type-metal is pumped into the mould forming a cast of the whole line. Afterwards the line of matrices goes to another place where each is put back automatically into its respective channel in the magazine. The finished line of type is called " slug ". It is delivered into a brass tray. The slugs are passed into the galley and further stages of work is as in hand-composition.

7241 Advantages

With the aid of about twenty matrices for each letter, it is now possible to set up books which would require thousands of types in hand-composition. Moreover it is easier to type a key board than to pick out letters from a case. Line-composition is about ten times as fast as hand-composition. Moreover one-piece line is easier to handle than a line composed of twenty or more pieces. The type-face is set fresh and is always new. But in hand-composition, after the book is printed, the types are re-distributed in the case. Mistakes may occur in re-distribution. This leads to wrong letters appearing in later compositions. This is called " foul ". Since the same type is used over and over again, some of the types might be broken. All these difficulties are avoided in lino-composition. After the printing is over, the slug is melted and cleaned. The type-metal is again ready for casting.

7242 Disadvantages

If any correction is to be made in a line, the whole line will have to be re-composed. If the correction shortens or lengthens a line, not only that line but also several of the neighbouring lines will have to be re-composed in order to secure justification.

725 MONO TYPE COMPOSITION

The "monotype" method involves two machines. The first has a key board as in a typewriter. By striking the key board the operator punches out on a "spool" of paper fed from the "paper-tower". The combinations of holes represent the letters, punctuation marks, spaces etc. After the spool is finished, it is passed on to the casting room. The "die-case" of the appropriate font is selected. It is a small square of steel in which are sunk brass matrices. The spool is fixed in a paper-tower. From there, it rolls itself over an air-pressure bar. The blast from it passes through the holes punched in the spool and sets the die-case in motion. This brings the appropriate matrix over the flow of molten-type-metal. In this system single letters are cast. That is why the method is called "monotype method." Each letter is arranged in its line in the galley one by one. The galley is moved up as soon as each line is completed. The entire process is automatic.

7251 Advantages

This method has got all the advantages of line composition. There are also some additional advantages. Proof correction does not involve re-setting of entire lines. Pools can be preserved and used for further editions.

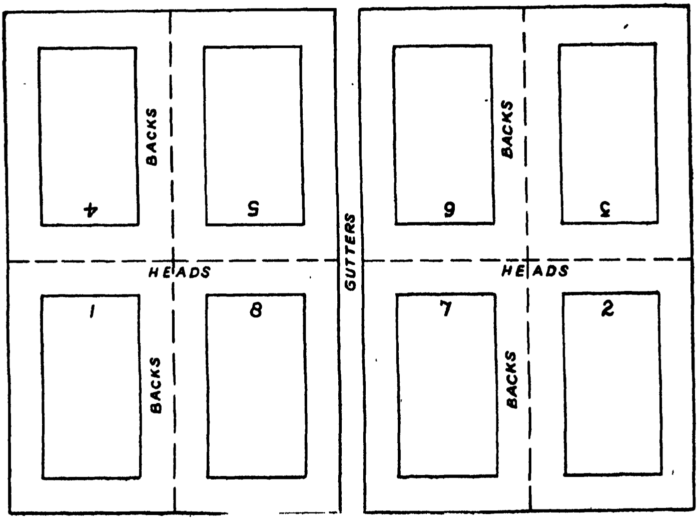
73 Imposition

After the corrections are carried out in the galleys, the matter is passed on to the "stone-man" for "imposition". Imposition is really putting

" in position ". He transfers the matter to the " stone ". It is a table whose top is of smooth metal. While still in the galley, the type is divided and arranged into page lengths and tied up with a cord, so that it may be moved about to a limited extent, without falling to pieces.

731 MAKE UP OF FORME

The pages are arranged into outer and inner " formes ". " Outer forme " is the set of pages which will be printed on the " recto " of the open sheet of paper. The numbers of these pages will be odd. The inner forme consists of the set of spaces which will be printed on the " verso " . The numbers of these pages will be even. The outer and inner formes taken together is called a " forme ". The arrangement of the pages for different formats, so that they will fall in the right order and in the



MAKE-UP OF FORME

right way up, can be worked out by folding the pages as for the right format, numbering the pages serially, and then spreading the sheet out. The position as well as the orientation of the pages will then become obvious as in the diagram in the preceding page. The blocks of any illustration to be printed with the text are inserted at the appropriate places. The pages are now provided with signatures, pagination and head lines.

7311 Signatures ✓

" Signature " is a small capital letter or figure placed alphabetically or numerically at the foot of the first page of each sheet. The signature is of use in " collating " which means checking to ensure that all the pages of the book are there and are in correct sequence. The signature really designates the various formes. It is a necessity to the binding department. It is also a convenience for the composing and machine departments. For the preliminary pages, lower case letters in italics are used as signatures.

7312 Black Step

A modern style of signature is known as " black step " method. In this method a rule about six points thick and 24 points long is placed in the " spine " of each forme *i.e.*, between the first and the last pages. In the first forme the rule is positioned opposite to the top line of text. For the next forme the rule is stepped down say 24 points and so on. The signature in the black step method will be covered away at the stage of binding.

That is why no signature digit is found in some modern books. The signature in black step method will not therefore be of any use in collating a book after binding.

732 LOCK UP OF FORMES

After an inner forme or an outer forme is made up, the next process is to convert it taken as a whole into a rigid plate. This process is called "locking-up". The aids used in locking-up are:

1 Chase ;
2 Furniture ; and
3 Quoin.

733 CHASE

Chase is a metal frame which surrounds the made-up inner or the outer forme. It is made of steel. It is heavy. In a "book-chase" the frame is fitted with two cross bars which divide it into four compartments and give it greater strength and accuracy when locking up a number of pages.

734 FURNITURE

Spacing material 24 points or more in width is called "furniture." It is made wood, cast iron or steel or plastics. When making up large blanks, furniture will add too much to the weight and it will undergo too much strain. It is therefore usual to use hollow furniture. Hollow furniture is called "quotations". The furniture is used to fill up the spaces between the pages and the chase and between the pages themselves.

735 QUOIN

The furniture employed to fill up the chase is "locked up" by the insertion and driving home of

" quoins." Quoins are devices used to exert lateral pressure on the type within the chase. They are either wedge-shaped or of the expanding variety. After the driving home of the quoins, the type is tightly jammed. The type and the chase and the furniture become one solid piece. The whole may be safely lifted without the types falling out or even being shaken.

736 FORME-PROOF

After the forme is locked up, a proof is pulled out. It is called " forme-proof". Strike-order is usually taken on the " forme-proof". The author should not introduce any author-correction at the forme-proof stage. For this will involve a re-make up of the forme, unless the effect of the correction does not go beyond one page.

737 DUPLICATE PRINTING PLATE

Ordinarily and for small editions printing is done from the locked-up form. But for fine printing and for large editions, printing plates are made from locked-up forme. Printing plates are valuable in several ways:—

1 Printing a job in " gangs " that is more than one copy being printed on the same sheet of paper ;
2 To save original photo-engravings and types from wearing out in press-runs ;
3 To allow the same job to be printed in many different plants at the same time ; and
4 To prevent accidental damage which use on the machine would involve.

Four kinds of printing plates are in use :—

1 Electro-type ;
2 Stereo-type ;
3 Plastic Plate ; and
4 Rubber Plate.

7371 Electro-Type

Electro-type is a longer and more expensive process. The oldest method of electro-type is by wax-moulding. The mould is black-leaded in order to give it a metallic face and increase its electrical conductivity, to assist the growth of the copper shell. It is then inserted into the electro-plate bath of copper sulphate solution. The copper shell which is to become the surface of the finished electro-type is allowed to be in the mould until the desired thickness is reached. The thickness can vary according to the run required from the plate. The shell is then brought to the standard thickness of a printing plate by the addition of suitable metal to the back. Lead moulding is frequently used in place of wax, particularly for electro-typing half-tone. It is also adopted for hygeienic reasons. For extraordinarily long printing runs, nickel shell is deposited or the copper shell is nickel-faced. For still longer runs chromium facing can be done.

7372 Stereo-type

Preparing the printing plate for stereo-type is cheaper. The moulding material used for stereo-type is called the " flong " or " papier machie ". The flongs may be " wet " or " dry ". Flong is composed of alternate layers of tissue and blotting paper fixed together by a special non-inflamable paste. It must be free from air bubbles or other irregularities. The flong is laid tissue-side downwards on the forme and beaten in. The mould so made is light and lasting. It can be stored for any length of time. Type-metal-cast is made from it and mounted on wooden blocks to type-height for printing.

The stereo can also be made in a cylindrical forme. Then it is called rotary stereo-type. This is suitable for production by rotary printing machines. This is now used largely in the production of newspapers. It is easier and cheaper to send paper matrices to other places for printing.

7373 Plastic Plate

Nowadays plastic plates are used. The trial issue of Unesco *Bulletin for libraries* produced in Delhi by the Indian Library Association was printed in September 1951 from plastic plates flown from Paris.

7374 Rubber Plate

In making rubber plates, a piece of unvulcanized rubber cut to size is brushed with French chalk and placed upon the mould. This is then placed under a hot hydraulic press for a few minutes to vulcanize the rubber. This is fitted to flat beds as well as curved cylinders of the printing machine by means of a special adhesive.

74 Printing Press

A " Printing Press" is essentially an appliance by means of which a sheet of paper is pressed against the inked surface of a forme of type, so that the ink is transferred from the type to the paper. The man in charge of the press-work is the " machine-minder ". Of the processes involved in the production of a book, none is more important than the work of the machine-minder. It is in his hand that the finished product takes shape. His work is not merely mechanical. All inequalities or deficiencies in material, workmanship or mechanical principle that are inherent or have crept in before the job reaches him must be set right by him. The forme or the printing plate is " laid on the bed " of the press. In the case of a forme it is hammered down by beating on a board kept on it, to make the type-face even. Then begin the processes of " registering ", " make-ready " and " striking ".

741 REGISTERING

By " registering " is meant the adjustment of formes or plates so that they will print in correct position over another forme or plate. This is very necessary in colour-printing. Even in ordinary printing it is desirable that the printed lines of one side of the sheet fall exactly on the printed lines of the other side.

742 MAKE-READY

" Make-ready " embraces the setting up of the press to print the particular quality of paper wanted and of making sure that each element of the type forme—small type, large type and plates—prints in the best manner. For this we must ensure that the plane of the whole type surface is absolutely even. Otherwise there will be uneven impression with alternative patches of heavy black and grey. The unavoidable margin of error in the heights of types etc. makes make-ready a necessary process. Make-ready is done by pasting thin paper at appropriate points in the paper-packing of the impression platen on cylinder, against which the type presses. A layer of paper may also be pasted under the type in the forme.

743 STRIKING

When registering and make-ready are completed, the forme is said to be " put to bed ". Then it is printed off: The type is inked ; the paper is fed either by hand or by machine and copies are taken by applying pressure with a machine. Letterpress printing-machines are of three types :—

1 Platen ;
2 Cylinder ; and
3 Rotary.

7431 Platen Press

A platen press prints from flat formes of type. Hinged to the bed is the " tympen " which is a frame holding a stritched canvass sheet on which the sheet of paper to be printed is fixed. Pressure is applied by a ponderous iron plate. The speed of printing is low.

7432 Cylinder Press

Cylinder press also prints from flat formes or plates. Paper is fed automatically. And pressure is applied by a heavy cylinder. Speed is high. Two thousand impressions can be taken in an hour. There are now " perfecting machines " which print both sides of the sheet in immediate succession. Printing the second side is called " perfecting ".

7433 Rotary Press

Rotary press prints from plates which are curved to fit the impression cylinders. It prints from a roll of paper called "web". Speed is very great. About 60,000 copies per hour may be reached.

7434 Faults

When the run commences and the sheets are going through, the press-man watches them to make sure that they are being printed correctly and corrects any faults that may be detected. The chief defects met with in running are:—

1 Slurring due to a springy forme going off the bed or by the recurring of blocks or due to the buckling or other causes;
2 Spaces rising due to a springy forme, rocky block, untrue wooden mounts or bottle neck slurs or faulty furniture;
3 Creasing due to wave-edged paper over packed cylinder, the sheets not being held tight or spongy packing;
4 Plucking which is experienced while printing on coated paper; and
5 Set off due to bad ink or wrong impression or ink drying on machine.

We should not therefore think that all copies in an edition will be equally good.

744 OFFSET PRINTING

Printing consists essentially in charging the surface with suitable ink and discharging the ink on to the desired surface. The kind of printing described till now is relief-printing. It is also called letterpress printing. In it the ink is rolled on the elevations and paper is pressed into close contact with the surface. Due to the ink having a greater attraction for the paper than for the material forming the printing surface, the ink is transferred to the paper. In another class of printing called gravure an ink of low viscosity is flowed into shallow recesses from which it is absorbed by paper by the same forces of selective attraction. In this case transfer of ink is accomplished under heavy pressure. As explained in section 753 lithographic method uses a perfectly flat surface and the ink adheres to the image section of the surface only. In this method too pressure is applied to the whole of the surface when a print is taken. These processes are all known as " direct printing " because the ink is transferred directly from the forme to the paper. In offset printing, the ink is not taken from the printing plate direct to the paper but is first made on an intermediate surface and transferred from there to the paper. The usual method is to have a special cylinder on which is stretched an offset blanket. As the print is reversed on the offset blanket and again reversed when it is transferred on to paper it follows that the matter which is to be printed offset should be positive on the machine plate. There are two offset processes known as " albumin process " and " deep etch process ".

745 ALBUMIN PROÇESS

In the Albumin Process a photographic negative is formed from the proof of the typed matter. This proof is usually called " repro-proof " because they are to be reproduced photographically. Acetate or cellophane proofs which are transparent are nowadays used.

7451 Stripping Operation

After the negatives of illustrations and type matter have been prepared they are " stripped " on a lay-out so that the press plate can be made. This corresponds to the make-up and lock-up in letterpress work. The purpose of the lay-out is to get the work square to the edge of the sheet ; also in correct position, and square on the offset lithographic plate. Whereas the letterpress make-up and lock-up work is done under a light, the offset lithographic stripping is done over a light so that he can best see the negatives. The stripper places the negatives in reverse on a " golden-rod-coloured " paper cut to the size of the press plate. The golden-rod paper gives support to the negative and also acts as a mask to the action of light when they are " burned-in " the plate. The light from the arc lamps used to transfer the image from the negative to the plate cannot penetrate the golden-rod-paper.

7452 The Preparation of the Plate

Plates for offset printing are usually made of cold-rolled zinc or aluminium. Stainless steel and other alloys also are used. The plates are first grained together with a slightly roughened surface to help the water and ink used on the press. After counter-etching *i.e.*, chemically cleaning, the plate is sensitized with ammonium bichromate and albumin. Then the stripper's negative, affixed to the golden-rod paper, is placed on the plate and pressed firmly together. After the plate has been exposed and printed, it is developed by rubbing developing ink over grained side. The plate is then washed in running water which removes the developing ink from the non-printing areas in the plate. The plate is then ground to prevent oxidation.

The fact that grease and water do not mix is the basis of the process of offset planography. In the offset plate the printing areas are greasy and the other areas are not greasy. When the plate is moistened water adheres only to the latter parts and not to the former. The ink does not adhere to the moistened part but only to the unmoistened part. Therefore the offset planographic plate prints though it is a smooth surface.

7453 Press Work

The printing machine consists of three cylinders:

1 The plate cylinder ;
2 The blanket cylinder ; and
3 The impression cylinder.

It has also an inking system and a damping system. The image from the plate cylinder is transferred to the rubber blanket on the blanket cylinder and from there it is transferred to the impression cylinder. High speed and close register are easily secured.

746 DEEP-ETCH PROCESS

Here the start is made with a transparent cellophane proof as a positive film. The positives are " strip " on a piece of transparent acelate and held in place in transparent tape. Golden rod paper is not used for this purpose. The positive is placed against the plate and a negative print results on the plate. The exposed parts of the plate are hardened, becoming insoluble in water. The plate is then developed to remove the unhardened portions of the cutting. It is slightly etched in the image areas by a solution which attacks the metal which leaves the light hardened area intact. It is then washed with anhydrous alcohol to remove the etching solution. It is then scrubbed to remove the light hardened stencil.

747 GRAVURE PRINTING

Gravure printing is the only process in which the type is screened as well as the illustrations. Therefore the type faces should be made with considerable care. For when type is screened not only letters are thickened but they also acquire ragged edge. Type face in small sizes that has fine lines and fine serifs should be avoided. The best types are those in bold, medium and light weights without serif. Start is made with transparent proofs in positive form. These proofs are usually on glassine-paper or onionskin paper which is less transparent.

7471 Exposure

Paper covered with sensitized gelatin called " Carbon tissue " is exposed to the glassine proofs and a positive film in continuous tone of the illustration, through a screen usually 150 lines to the inch (The screen is described in section 7512). Under this exposure the coating on the carbon tissue is hardened in proportion to the amount of light which passes through the film and the glassine proofs. It is hardened least in the shadow areas ; more in the middle tones ; and most in the highlight areas.

7472 Gravo Cylinder

The carbon tissue is put on the polished copper cylinder. The cylinder is then developed. The parts of it that are not to print are now painted over with an acid resistance and the cylinder is thus etched. Where the screen lines are located, there is no etching as they are acid proofs.

7473 Press Work

The Gravo press is rotary. After inking, as the cylinder turns, a " Doctor Blade " scrapes off all ink from the unetched surface or the smooth part of the cylinder leaving the ink only within the etched shelf. When the cylinder comes into contact with the paper, the ink is sucked out of the cell. It adheres to the paper, spreading slightly. Super-calendered printing paper produces the best result.

748 PHOTRONOGRAPHY AND THE FUTURE

We now appear to be on the eve of revolutionary methods in book production—no metallic types, no composition, no plates and no wet ink, but more than thrice the present speed of production. Such is the picture conjured in Daniel Melcher's *New development in printing: A progress report* appearing in the *Publisher's weekly*, V. 161, No. 5, of 2 February 1952. I shall call it "photronography".

7481 Ink Powder

This method is being developed by William C. Huebner and the Standard Register Company of the U.S.A. In this method ink is replaced by dry, finely divided, ink-powder. Pressure is not used in the traditional way to transfer ink from type to paper. There is no contact between plate and paper. In fact there is a gap of about one thousandth of an inch between them.

7482 Composition

The composing machine is a key board machine. Alphabets are arranged in the form of images on film. They can be simultaneously focussed through lenses on to a receiving surface. The appropriate letter is unmasked by keyboard action so as to project its image. Justification is automatic.

7483 Printing

The plates are thus nothing more than photographic negatives or positives fixed to transparent cylinders. A light shines through a slot behind the film to drive ionised "smoke" particle into the paper and create the image. The image is intensified by electronic means to the point where it will then "smoke" on to the paper in sharp outline.

7484 Film-Belt

The film from which a book is to be printed will be made in the form of an endless belt of variable length. Whatever be the length of the book the entire volume can be printed with one circuit of the belt. Web of paper is used. Folding is done by a part of the printing machine. Gathering of sheets will thus be eliminated.

7485 Self-made Paper

It is even conjectured that the printing machine may be expected to make its own paper. The printer will have simply to dump a bale of fibre at one end of his machine, turn a few dials and feed his press with freshly made paper of any weight, thickness, finish or colour and in any desired web-width. It will take the " smoke " ejected by pressing the key-board of the composing part of the machine.

75 Illustrations

The following are the three main processes of printing pictures :—

1 " Relief Process " in which the surface which takes the ink is above the rest of the surface which does not take ink ;
2 " Planography " in which the surface that takes the ink is at the same level as the rest of the surface ; and
3 " Intaglio Process " in which the surface that takes the ink is below the rest of the surface.

Whatever be the process used, all pictures are made in lines, dots, flat tints and tones of varying intensity. All forms of light and shade are expressed by the arrangement in gradation of these elements.

751 RELIEF PROCESS

This is the simplest of the three processes. In the "Relief Process" there are three methods :—

1 "Wood-cut";
2 "Half-Tone" Block used to reproduce designs made up of tones such as photographs, oil-paintings or water-colour drawings; and
3 "Line Block" used to reproduce designs made up solely of lines such as pen and ink drawings and statistical diagrams.

7511 Wood-Cut

The picture is transferred in reverse to a smooth level piece of wood. The wood is cut away in the places which are not to print. Being in relief as a patch of type the two can be easily printed together. The fine dots and lines cannot be fine enough as they will get damaged by the pressure of printing. This places a certain limit to the fineness possible in practice. Relief block printing cannot therefore be used to reproduce satisfactorily a drawing in which the toning is an important feature. Today there is very little engraving. It is now done by photo-mechanical means. This has resulted in half-tone block and line-block.

7512 Half-Tone Block

Half-tone comprises tones of varying depths brought about by lines or tints of varying intensity of tone. A photographic negative of the picture is made by interposing, between the lens and the negative, a screen consisting of two plates of glass fixed together with transparent cement, each containing black opaque parallel lines engraved on it very close to each other, the lines of the two plates crossing at right angles. The number of lines to an inch vary from 50 to 200. The resulting screen is like trellis-work with tiny square windows of glass. As a result of passing through this screen, the image of the original on the sensitised plate is broken up into dots and squares, instead of the continuous unbroken tone beaten in an ordinary photograph taken without the screen. After development the negative is placed over a polished plate of copper on which a solution of potassium bichromate and fish glue has already been evenly applied and dried. This is then exposed to light. The light decomposes the water-soluble bichromate, which is turned into insoluble chromic oxide. The negative is then removed and the plate is washed. Then the image broken up into dots and squares remains on the surface, the opaque parts of the negative and the rest being dissolved by water. The plate is then soaked in violet aniline dye. This colours each dot and makes the picture show clearly on the metal. The print is next " burned in " or heated and then cooled slowly. This turns the coating into a hard acid-proof enamel. The burnt-in plate is now cleaned with a mixture of acetic acid to remove all traces of coating from between the dots. The plate is then placed in a bath of ferric chloride. This eats away the unprotected copper between the dots leaving the dots themselves in relief. It is then mounted on a block of wood and brought to type-height. This is " half-tone block ".

7513 Line-Block

In the case of a " line-block " no screen is used. The negative is printed on a zinc-plate which has been sensitised with bichromate and egg albumin. It is then rolled with a leather roller charged with stiff greasy ink. The print is then washed with water. Then the image alone, now covered with ink, remains while the rest of it is washed away. The zinc print is now slightly warmed and then dusted over with a resinous powder which sticks to the inked portion of the plate. It is then heated till the resin melts and incorporates with the ink. This causes an acid-proof coating over all the lines of the picture. The plate is next placed in an etching bath containing dilute nitric acid. The acid eats away the unprotected zinc between the lines leaving the lines themselves in relief. It is then mounted on a block of wood and bought to type-height. This is " line-block ".

752 PLANOGRAPHY

Lithography is the name by which planographic-process usually goes, as the printing surface is neither raised as in letterpress nor recessed as in photogravure but quite flat. Planography is often referred to as chemical printing because the principle is based on the chemical property (some scientists claim that it is physical and not chemical) of certain calcareous stones and such metals as zinc and aluminium which are in a chemically clean condition to undergo certain peculiar changes when brought into contact with organic fatty acids. The fatty acid is absorbed by the stone or metal and unless forcibly removed, it becomes a part of the stone or metal and such parts have the property of all fatty acids in that they are greasy and attract similarly any greasy substances that are applied over them, while they repel water or watery substances. The process depending on this chemical property is called lithography. Another process depends upon the reaction of gelatin to light and water. There are three different processes of planography:

1 Auto-lithography ;
2 Offset-lithography ; and
3 Collotype.

7521 Auto-Lithography

The lithographic stone, as it is called, is quarried in Germany. It is calcareous, that is, it is composed largely of calcium carbonate, and is porous. A thick slab of this stone is levelled on both sides, and the side, that is to be printed from, is ground with sand for purposes of cleaning and to give a grain to the surface. There should be no scratches on the face of the stone. The stone is dried. On this the artist draws the picture in the reverse way, with a special crayon, the grain giving the necessary tooth for the crayon. The crayon to all appearance is like the crayon used by artists for drawing on paper. But it contains greasy fatty acids.

When the artist has finished his drawing, the stone is coated over with a mixture of gum arabic and dilute nitric acid. The nitric acid attacks the bare parts of the stone (being made up of calcium carbonate) but the acid is not strong enough to etch it to any depth. The purpose of the acid is not to produce any depression in the non-printing parts. It is not necessary in planography (which, applied to work on stone and even on metals is more commonly referred to as lithography) to produce any difference in level between the printing and non-printing parts. The purpose of the acid is to produce a granulated surface in the non-printing parts, so that water can collect in small quantities in the hollows of these granular parts. The object of the gum arabic is to make the non-printing parts insensitive to grease. Gum arabic also contains an organic acid in it, namely, arabic acid which acts on the stone in the same manner as the greasy fatty acids. After absorbing arabic acid, the stone behaves in the opposite way to that of the greasy parts—it repels grease and attracts water. These stones (and also metals) have the property of being rendered grease-attracting and water-repelling by the initial application of greasy fatty acids, and water-attracting and grease-repelling by the initial application of gum arabic. The way the stone will behave in any part of its surface will depend on whether a fatty acid or gum arabic came into contact with it first while in a chemically clean condition. Once this change has occurred, nothing can alter the behaviour of the stone or metal, till that layer is removed by mechanical or chemical means. The theory is that the surface of the stone in a chemically clean condition contains (as opposed to acidic) a basic substance which in this case is calcium carbonate, and metals such as zinc and aluminium which are used in the place of stone, contain zinc oxide and alumina. A few molecules on the surface undergo chemical or physical change when these basic substances come into contact with acidic substances. The change is permanent, until the molecules are bodily removed or are acted upon by strong acids.

When the gum is dry, the stone is washed with water which removes all the gum on the surface (the stone has already absorbed what it required and what is absorbed cannot be washed away). The picture drawn in crayon is still there on the stone. This is washed away with turpentine. Now the picture has disappeared, as turpentine has dissolved away all the grease with which the picture was drawn. The stone looks to all appearance as it did soon after it was grained and polished, that is, a surface completely bare. Yet, it is by no means bare. Invisible though it may be, the picture has been indelibly fixed on the stone, as we shall presently see. The stone is damped with a wet cloth, and while still wet (the granular surface produced by the nitric acid helps to retain the water on the surface) the stone is rolled with a roller charged with stiff greasy ink (the ink is ground in linseed oil which contains the fatty acid, *viz.*, linoleic acid). Gradually the picture comes back to sight; for, the stone in those parts is grease-attracting, and therefore, the greasy ink particles collect on those parts, making the picture visible. The parts which have absorbed gum are grease-resisting and therefore ink particles are unable to adhere to those parts so long as such parts continue to hold water. That is why the stone will have to be frequently damped while being rolled. If the water evaporates leaving the stone dry, then ink particles will stick to the stone ; but this will not do any permanent damage. When damped again and rolled, the ink particles come away from those parts, as grease can never remain there in the presence of water. When the picture has been fully charged with ink, the stone is dried by fanning it. A sheet of paper is placed over the stone and pulled through under pressure in a lithographic press. When the sheet is taken out, a print of the picture is obtained on it. The stone is damped again, rolled with ink, and the printing continued.

This is not only a very interesting way of printing but it will be noticed, that it is a quick and comparatively inexpensive way of obtaining prints of pictures or for the matter of that, any other kind of matter.

What has been described regarding stone applies equally well to the metals, zinc and aluminium, which possess similar properties. Nowadays these metals have superseded stone. Because metal sheets are easier to handle, they can be wound round a cylinder and printed on the rotary principle. They are not liable to get broken as stones are. They are cheaper and large sizes can be used, which will be impossible with the stones on account of their huge weight.

There is not much direct drawing on metal or stone done these days. The drawings are made on grained " transfer " paper (like " transfer " pictures used by boys to affix pictures to books, these " transfer " papers have a coating which can be transferred to other surfaces) and transferred to metal.

Most lithographic work today is done from prints obtained from photographic negatives. The metal sheet is coated with egg albumin and ammonium bichromate and allowed to dry. A photographic negative is made of the original and this is placed in contact with the sensitized metal and exposed to powerful arc lamps or bright sunlight for about three or four minutes. The negative is taken out, and a cloth soaked in printing ink diluted with turpentine is passed over the plate. It is then washed with cold water which dissolves away all parts not affected by light. In those parts which have been rendered insoluble by the action of light, the image remains in the plate. The non-printing parts are desensitized with gum, and the plate can be printed from, as if the image was directly drawn on the plate with greasy ink.

Pictures containing tones such as paintings, photographs, wash and pencil drawings can all be produced by lithography. Screens such as are used in relief process for making half-tone blocks have to be used in lithography except when the picture is drawn direct on stone or transferred from paper, in either of which cases, the grain is obtained by rough graining the stone or paper.

7522 Offset Lithography

There are certain defects in printing direct from stone or metal on to paper. As the printing surface is on the same level as the non-printing parts, very considerable pressure is required for the transference of ink, unlike relief process or intaglio in which a difference of level makes it necessary to use but little pressure in printing. Another difficulty is that fine screen half-tone images require a smooth coated paper for printing. Coated paper is affected by moisture, as the coating is fixed by a water-soluble adhesive, and it comes away on being wetted. As the printing plate is damp, coated paper is ruled out for printing direct from metal. Hence half-tones of fairly rough screen which do not require a coated paper have to be used.

All these and other difficulties are overcome by taking a print from the plate on a smooth rubber sheet in the first instance, and then printing on to paper from rubber, in other words, printing not directly from metal but from an offset impression on rubber. This process is known as "offset lithography". As rubber adapts itself as readily to the irregularities in the metal plate as to those in the paper, comparatively little pressure is required, and there is a full transference of ink. Also half-tone images and even fine line work, can be printed on paper of however rough a surface, if printed by offset.

The metal plate is clamped round a cylinder which is in mesh and in contact with a cylinder of the same diameter round which the rubber sheet is stretched. In mesh and in contact with this cylinder is the impression cylinder, also of the same diameter. The paper passes between the rubber cylinder and the impression cylinder. In more recent machines paper is pressed between two offset cylinders and printed on both sides simultaneously. This eliminates the need for impression cylinder.

As there are two transferences in the course of printing, needless to say, the image of the picture on the plate should be in the same way (not in reverse as in direct lithography) as it should appear in print. Most lithographic work is done by offset at the present time. The chief defect is that on account of the double transference there is a certain lack of depth of colour. By the use of highly concentrated inks, this defect is largely got over. A new development combining offset lithography with intaglio called " offset deep " promises to make up for all the disadvantages of lithography in comparison with intaglio printing, while retaining the qualities which are peculiarly its own.

The chief uses for lithography are pictorial work of large size, work requiring the use of many colours, prints on tin and other metals and all pictorial posters.

7523 Collotype

Collotype is also called photo-gelatin process. It is more nearly photographic than any other printing process. The printing surface is a photographic positive in glass. A negative which contains no screen is made from the copy. A large piece of plate glass, about 6/16 inch thick and having ground sides, is cleaned and coated with waterglass. The glass then receives a coating of gelatin, which is dried by heating. The negative and glass are placed in contact before a strong arc light. The still-soluble sensitizer is then washed off, the plate is dried and next immersed in a bath of water and glycerine. The most soluble (least light-hardened) portions of the copy are dampened most ; the least soluble (most light-hardened) portions least. In printing, the various portions of the plate accept the greasy ink in inverse proportion to their dampness.

Later methods employ an aluminium plate, from which impressions are made in a manner similar to that used in offset-lithography. The presswork is quite costly and slow. It is moreover a short-run process. It is difficult to print more than 2,000 copies.

753 INTAGLIO PROCESS

If a smooth plate of copper is taken and a line scored on the surface with a sharp instrument so that every part of the line is below the surface of the plate then the line is said to be engraved " intaglio ". Supposing now we take some thick and stiff ink and apply it to the surface of the plate. The ink will fill inside the engraved line and the surplus ink remains on the surface. This surplus ink is removed with a cloth, taking care not to remove the ink contained inside the line. A sheet of moistened paper is placed over the plate and pressure is applied. The ink is drawn out of the line through the adhesion brought about by the heavy pressure and the suction of the wet sheet. The line which is printed on the paper will be of the same width as the engraved line, and the intensity of the colour of the line will depend upon the depth to which the line is engraved. The most complicated design in fine line can be engraved in like manner. All degrees of width of lines (with the limitation that no line be too wide that the ink will wipe out of it) and great variety of depth of printing lines can be made on the copper. The finest line that the human hand can engrave is the only limit to the degree of fineness of intaglio line engraving, for if the ink is of the proper quality it will fill in the merest scratch on the copper. Furthermore, the finest line will stand up under the pressure of the press and a series of such fine lines, however near together, may be printed so that each one is sharp and firm on the impression. The thick dense body of ink gives richness to the impression which gains an additional soft mellow quality from the shadows cast by the printed lines which are in perceptible relief on the paper. The lines in the shadows may be engraved very close together, sufficiently so almost to touch one another and yet their separation can be preserved on the impression, thus enabling the engraver to obtain a luminous quality in large masses of shadows, which in relief printing would appear dull and lacking in richness. While in relief printing it is necessary to maintain the same quantity of ink all over the surface, and only the thinnest film is possible, if it is not to be squeezed out into the depressed parts, in intaglio the quantity of ink carried over the surface can be made to vary by varying the depth of the lines. The ink that is carried by the printed lines in the shadows is not a thin film as in the case of relief printing, but a thick layer, which gives the shadows a depth and velvety richness unequalled in any other process. Great smoothness of silken texture is obtained in the high lights by the tiniest scratches on the surface. This smoothness also is unobtainable by the relief process.

One can see, therefore, that intaglio line engraving is superior as a process to relief-block engraving for obtaining depth of colour and delicacy and smoothness of the lighter tones.

7531 Photogravure

The engraving of the plate is not nowadays done directly. It is done by photo-mechanical means. This has resulted in "photogravure." As in the half-tone form of relief process, a screen is used, which breaks up the design into tiny squares. Unlike in the screen for half-tone, in this screen the lines are transparent and the intervening squares are oblique. When the negative of the original picture is photographed on to zinc plate, the darker parts of the original are reproduced on the zinc in the form of fatter dots than the lighter parts. The plate is given a coating which protects it from acid (except where the dots occur) ; it is then etched in a bath of acid. The darkest parts are eaten away most by the etching process, and the lightest parts least. The parts immediately under the cross-lines of the screen have not been affected at all by light, and therefore during the etching process they remain untouched by the acid. Thus, after etching, the plate consists of a series of tiny ridges and of countless tiny hollows between the ridges. When the printing takes place, an ink scraper on the printing-machine wipes the ridges clear of ink. The deep-etched hollows (the darks of the original) hold much ink and the shallow ones (the lights of the original) hold little or none. Therefore, when the plate is pressed against the paper, the dark and light tones of the picture are printed exactly as they were in the original.

In etching for half-tone block, it is the unwanted or white portion that is etched away and the wanted or the print-portion is protected. In etching for photogravure, it is just the reverse.

Both in half-tone block and photogravure, as in modern methods for cutting punches for types, the artist is saved from the task of working with hard materials. He has all the ease of working on paper or canvass with ink or colour to produce the original. He can leave the rest to photography and the processes that follow.

754 COLOURED ILLUSTRATIONS

For reproducing coloured paintaings in oil colours or water colours, half-tone blocks are made by the trichromatic process. This process is based on the theory that every conceivable colour can be produced by suitable intermixture of the three primary colours, yellow, red and blue. The original is photographed three times, one to record all the yellows contained in the picture, the second for the reds and the third for the blues. This recording is made possible by interposing in front of the lens, pieces of celluloid or glass, coloured violet for the yellow plate, green for the red plate and red for the blue plates. These are called " colour filters ".

Blocks are made as already described from the three negatives, and the yellow block is printed in yellow ink, the red block is then printed on top of the print already obtained in yellow, and finally the blue is printed on top of both the other colours. If the blocks had been made properly and the correct colours of inks used, and the printing done in such a fashion that the three printings fell exactly on top of each other, then the final result will be a more or less exact reproduction of the original.

The three-colour process (that is, printing in yellow, red and blue in superimposition), while it gives excellent results by the relief process, and fairly good by photogravure, is unsatisfactory by lithography. This is mainly because the correct colour values of yellow, red and blue cannot be obtained each time, as the prints lack in depth and brilliance.

The defects have to be made good by overprinting with other colours, principally pink, a deeper blue, brown, black and sometimes, grey. Ten and twelve printings on top of each other are not unusual for first class work if the originals can be successfully matched only by such means.

76 Publisher's Casing

After the sheets are printed and assembled the book is bound. We shall be dealing with reinforced library binding in Chapter 8. The binding that is given by the publishers is called publisher's casing. It is done mostly by the machine. The covering material is often cloth. Cloth may be had in dozens of different qualities and in as many surfaces and colours. Great play may be made with these in coloured inks. Before the war, gold was in use for tooling. Now it has become too costly. Special attention is devoted to the treatment of edges. Before war the top edges used to be gilded. This made the cleaning of books easy. It also gave an air of richness and distinction. Sacred books used to be gilded on all the edges.

761 JACKET

It is now usual to provide a jacket for the books. It is made of paper of some suitable colour. It is usual to print not only in spine, the front and the back but also the flap. Blocks of one kind or another are used to make it attractive. The printing processes used for jackets are the same as those used in the printing of books. The planographic process produces the best result.

77 India

Printing and renascence emerged together in Europe. The later emergence of engineering, chemical technology, and photography had made printing keep pace with the further development of the west. India's renascence will have to pick up printing at the stage up to which the West has brought it. There is a variety of scripts in India which is making large scale production of types, matrices and punches wasteful. To reduce all the languages to one script is the wisest thing to do; but sentiment and politics will not allow it. The different styles of any given family of type faces are too few now. To produce the maximum effect something should be made to increase the styles. When I organised the Fifth Centenary of Gutenberg under the auspices of the Madras Library Association, in 1940, we had an enterprising type caster who was willing to take up the problem. He belonged to the Ganesh Type-foundry. But unfortunately the war conditions stood in the way. In regard to the printing processes, nothing need stand in the way of India adopting the latest methods available. But book-printing has not yet been properly developed. Newspaper printing and job printing are developed. It is very often these very printers who have to do books also. The greater elegance needed for books is not therefore easily forthcoming. Our printers should learn the value of engaging artists to design every part of the book. Since social education literature has to be produced on a vast scale and since it will have to be sponsored by the governments in the first instance, a splendid opportunity offers itself to pull up the standards and fix them at a high level without muddling through. The appeal of Social Bibliography is not only to the government but also to the industrialists who will have to organise and develop the printing trade along right lines. A book is a work of art. Type face, lay out of the page, printing and binding are all works of art. It is therefore improper to admit any standardisation in the end product. However, the technical processes involved in printing are so many. These will have to be rightly within the jurisdiction of the Indian Standards Institution. Social Bibliography can benefit by that body bringing the printing trade of the country together and bringing in also the library profession into the picture to represent the consumer's interest and to emphasize the requirements of the Laws of Library Science.

78 Librarian

A knowledge of printing and particularly familiarity with the possible defects which may occur in the production of a book at different stages will stand a librarian in good stead in doing his daily work. In book selection if there are different editions of a book a knowledge of printing will enable him to choose the edition that will be more satisfactory to the service of his clientele. The type face, the illustrations, the leading and the margin will have to vary with the clientele according as they are children, neo-literates or advanced thinkers. At the time of accessioning, a Librarian, who knows about the structure of the book and the risks to which the book is exposed at the time of press work, the folding of the sheets and binding, will have a greater awareness in examining the copy that has arrived in the library and will soon develop a flair to find the faults. As stated in section 77, the physical book is a work of art which the librarian has to handle and popularise among people. He should be able to appreciate its artistic features. A knowledge of the techniques employed and of their comparative merits will be of help in the development of his sense of appreciation. This is the most fundamental reason which social bibliography will press upon librarians for acquiring an intimate knowledge of this miraculous art of printing.

CHAPTER 8

BINDING

The purpose of binding is to secure together firmly as a single unit all the leaves of a book in such a way that any page required may be opened up readily.

801 EASE OF HANDLING

We had seen in chapter 1 how the leaves of a book were once made into a single continuous web and kept as a roll in cylinders. When kept in this form it was not easy to get at any desired line in it. Later the leaves of the web were folded up as the feathers of a Venetian window. It is only after these inconvenient forms were lived through that the present form of arranging and binding the sheets was devised.

802 AESTHETICS

We had seen in chapter 3 the psychological part binding can play in attracting the common man to the use of books or in repelling him. We dwelt on the aesthetics of binding and emphasised the need for making the look of the binding beautiful and its feel pleasant.

803 MASS BINDING

We had also seen in chapter 5 the evolution of binding from the stage of over-ornamentation of the medieval age to that of puritan simplicity and dignity of the modern times. We further witnessed the effect of the mass-production of books by printing machinery. Mass-binding became necessary. We listed the diverse machinery invented for the diverse operations involved in binding. The speed of binding has now reached 3,000 per hour. This speed is attained in the case of " edition-binding ", that is binding hundreds of copies of one and the same book released by the press in one instalment. This is also called " publisher's casing ".

804 BY-PASSING IN FUTURE

In chapter 5 we also got a glimpse into the future. We found that at least so far as old books and books for the scholars were concerned, one of three things may happen. We may revert to the book in the form of a continuous reel of micro-film rolled up in small cans. Or, we may file them in cabinets as loose micro-film strips. Or, each book may take the form of a single micro-card of size 5″ × 3″ or so, so that the question of binding may be altogether by-passed.

805 BY-PASSING FOR PERIODICALS

One immediate influence of micro-forms is the by-passing of binding in the case of periodicals. Micro-photography of articles in periodicals will be facilitated if each leaf of a periodical can be put flat on the table. Present methods of binding it into a volume do not allow it. But each individual issue is only stitched through sheets and paper-covered. This admits of placing each leaf flat on the table. It is therefore now becoming the practice to preserve the periodicals as loose issues instead of binding them into volumes.

8051 Finance's Vote

Finance too votes for this. For the periodicals have grown so much in their number. Even the number of periodicals taken in one library has grown to a large figure. The cost of binding them is becoming prohibitive. The frequency of their use does not justify the investment of much money on their binding. In the case of learned periodicals, the few that call for back volumes will be highly organised personalities who can be expected to maintain a file of loose issues in a useable state. In the case of popular periodicals which appeal to the common man, few readers call for back volumes. Thus in either case, binding of volumes of periodicals is avoidable and will be the first thing to be avoided on grounds of finance.

8052 Fourth Law's Vote

The Fourth Law too would support the avoidance of binding of periodicals into volumes. A periodical volume is a composite book of unconnected contributions not asking for continuous reading. When a reader wants a particular article, a whole volume containing scores of other articles can be given out. Till it is returned, the other articles are thrown out of access. Any reader needing any other article has to wait till the first reader returns the volume. This involves waste of reader's time and loss of his tempo and perhaps even the evaporation of his urge to use it. On the other hand, giving out a loose number will minimise this risk. To give out loose numbers. volumes of periodicals should be left unbound.

8053 By-passing Periodicals

Finance will even go to the length of stopping the present method of communicating nascent thought through the medium of periodicals. For there is no doubt that financially one of the weakest and wasteful forms of literature is the periodical. The more learned a periodical is the smaller is its circulation. Indeed the number of readers for any single article in a periodical will be so uneconomically small that nobody would dare to publish an article as a separate. That is the reason for stringing together quite a number of unrelated articles and publishing them under one cover as a single periodical. The result is that any-body who wants a particular article has to take the whole periodical. To give relief to the financial difficulty involved in production, recourse is virtually had, in this method, to a forced selling of unwanted articles: This forced thing will of course be in its worst form in relation to individuals. But even when the public share a periodical, that is when a single copy of the periodical is acquired and served to all possible users within the jurisdiction of a library, as a public project, there is still forced sale ; for, there are still articles which are not wanted by any of the readers. Moreover so much new thought is being created today and at such high rate by team work in research that the number of periodicals needed to communicate them while still in a nascent stage is very great. Even within one subject the number of periodicals is too large for most libraries to take them all exhaustively. Bernal has gone into this question of economy in the supply of micro thought very elaborately. But the world seems to be lacking very much behind him in this forward thought of his.

A possible mode of communicating nascent thought is as follows: Each creator of new thought should send his script in duplicate to the learned body in which he is affiliated. When it is finalised and accepted, the learned body will forward a copy of the approved draft to the National Documentation Centre forming part of the National Central Library. It will also furnish a draft abstract of the article. The National Documentation Centre will finalise the abstract with expert abstractors and classify it with expert classifiers. The Centre will include it in its *Abstracts weekly*. This weekly will be widely circulated. Every reader who feels the need for a study of the full article will immediately write to the National Documentation Centre. On receipt of all such requisitions within a prescribed time, the Centre will furnish copies to the enquirers. It may be a carbon copy or a photostat copy or a copy produced by some near-printing process or a copy produced by ordinary printing. Or it may be in the form of a micro-film, microstrip or micro card. In this mode of communication of nascent thought, periodicals will cease to exist. Finance will thus by-pass not only the binding of periodicals but even the production of periodicals.

806 RE-INFORCED BINDING

For the time being however the book for the masses will have to be in the familiar form to which we are now accustomed. Social Bibliography has therefore to pay attention to the binding or books printed on paper and given the weight, size and shape, whose optimum was described in chapter 1. In other words, the age of the mystery material and miraculous art described in chapters 1 and 2 will persist for many years and call for attention to binding. The heavy wear and tear to which books of a public library have to be subjected in being served to the public to the full satisfaction of the Laws of Library Science, has led to "re-inforced library binding".

807 LIBRARY'S FREEDOM

In the case of paper and printing, individual librarians have to accept what the book trade gives. It is only the profession as a whole that may be able to exert any influence on the quality of paper and print. But the individual librarian has full freedom in the binding of books. He can ask for any quality. He will have to supervise its execution personally. He should be able to assess its correctness. Therefore, so long as the present conventional binding has to be continued, each individual librarian should have greater familiarity with the details of binding than details of printing, type-casting or paper-making. We shall therefore begin with a detailed specification for re-inforced library binding and devote the rest of the chapter to a study of its clauses. The library routine involved in getting volumes bound has been described in chapter 995 of my *Library administration* and section 466 of my *Library manual.*

81 Specification

811 SHEET WORK

1. *Collation.* All books received by the contractor are to be examined and collated and any

found to be imperfect or seriously damaged are to be returned unbound to the librarian. Torn leaves and plates are to be neatly repaired.

A periodical shall not be held to have been collated properly nor to be perfect, unless all the parts of a volume are bound in correct order of pagination and the usual title and contents pages and indexes are inserted in the proper places. Unless each imperfect and damaged book is reported upon to the librarian and unless the librarian has instructed the contractor to proceed with the work on such books, the bill will not be paid for any such books bound or repaired.

2. Wrappers and advertisements in periodicals and books are to be bound in, if the contractor is instructed to do so; otherwise, they are not to be bound in.

3. *Sewing*. Books printed on paper of good quality are to be sewn one sheet on (except where thinness of paper makes it necessary to sew two sheets on) with unbleached thread of suitable thickness over unbleached linen tapes. Books printed on soft, spongy or brittle paper are to have the sections lined at inner and outer folds with strips of thin but tough paper before they are sewn. All sections broken at the back are to be lined with tough paper or linen strips, and where necessary neatly overcast on modern methods of cross stitching before being sewn to the tapes. The first and last sections of all books are to be enclosed at back in linen strips. All separate leaves, plates, maps, plans, etc., are to be mounted on guards of linen or tough thin paper and to be sewn

in. Pasting on is not to be permitted. Double plates are to be guarded at the fold. No charge is to be made for the first dozen plates so guarded in each book. For books up to post octavo (6¼″×3⅞″) three tapes, one-quarter inch in width, are to be used. For books of crown octavo (7½×5″) four tapes, one-quarter inch in width, are to be used. For books of larger sizes the number of tapes and their width are to be increased in proportion. Two of the tapes are to be placed within one inch of the head and tail of each book.

Straight-line machine stitching will not be accepted.

Books printed on calendared or heavily loaded art paper are to be reported to the librarian and a quotation sent to him for lining each leaf of such books with a linen hinge on a throw-up guard.

4. All folded maps and illustrations are to be mounted on jaconet or thin linen of good quality and to be charged for separately.

5. *End-papers.* End-papers are to be of good touch opaque paper of approved mild colour, with at least one plain white leaf between each of them and the printed matter. The end-papers are to be made with strong linen or cloth joints and to be sewn on as a section.

6. *Cutting edges.* Unless otherwise instructed the contractor is to cut edges of books accurately and to take care to leave margins as wide as possible. Unless other instructions are given, the edges are to be sprinkled or tinted with a colour harmonising with the colour of the materials used for covering.

812 FORWARDING

7. *Forwarding.* Unless otherwise directed, all books should have French joints and tight or close flexible backs with the covering materials attached directly to the back. Tapes are to be firmly inserted between split boards. Books bound in quarter leather or in cloth or in buckram are to have the boards slightly rounded at corners and the covering material is to be neatly folded and not mitred.

Leathers are not to be unduly pared down or unduly stretched in covering. The covering material of back is to extend over boards to at least one-sixth of the width of the book. All books should open up freely and lie flat.

813 FINISHING

8. *Lettering.* Lettering is to be impressed in best gold directly on to the material which covers the book. The lettering is to be of good size and easily readable; small lettering will not be accepted except on very thin books. No extra charge will be allowed up to and including fifty letters or/and figures.

814 SIZES

9. *Sizes.* The size of a book is to be determined by the measurement of the board, the square of which must not exceed one-eighth of an inch in books up to crown octavo, and proportionately for larger sizes. Extra charges for thickness is to be allowed only when the thickness of the volume exceeds one half the width of its boards. No extra charge is to be made for two or more volumes bound in one, unless the thickness of such a volume exceeds one half the width

of the boards. In submitting the bills for work done, the measurement of the board should be given in inches in addition to the conventional mode of specifying the size.

815 GENERAL CLAUSES

10. *Alternative suggestions.* When the preceding instructions are obviously inapplicable to any book or for any reason undesirable, the contractor is to submit suggestions for binding such a book with estimate of cost.

11. *General.* The whole of the work in binding is to be carried out with due regard to the fact that the books will be subjected to hard wear and tear and that the binding is to be permanent. Special instructions, if any, given with reference to particular volumes sent for binding should be faithfully carried out.

816 MATERIALS

12. *Thread.* To be of best unbleached linen of suitable thickness.

13. *Tape.* To be of best unbleached linen, of close strong texture and of the specified width.

14. *Glue.* To be best quality flexible glue mixed with copper sulphate to keep off insects.

15. *Board.* To be good quality mill boards.

16. *Leather.* The contractor must guarantee or undertake to produce, when required, the guarantee of the firm supplying the leather, that all skins used (1) have been tanned in sumach or mimose or similar vegetable stuff, or a mixture of them ; (2) are free from sulphuric or other deleterious acids ;

(3) have been dyed with colours that are fast with respect to light as well as moisture ; and (4) are genuine as described.

17. *Buckram.* To be linen buckram of best quality.

18. *Cloth.* To be good quality art canvas or imperial morocco cloth of fast colour and finish.

19. *Gold.* To be best English gold.

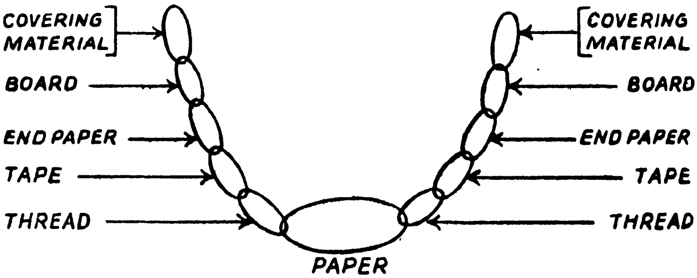
817 STYLE

20. *Styles and sizes.* All combinations of the following :—

1. Style.
    1 Half morocco and calico.
    2 Half morocco and marble.
    3 Half calico and marble.
    4 Full linen buckram.
    5 Half linen buckram and calico.
    6 Half linen buckram and marble.
2. Height.
    1 6″ or less.
    2 Between 6″ and 8″.
    3 Above 8″.
3. Thickness.
    1 Less than 48 pages
    2 Between 48 and 100 pages
    3 Between 100 and 500 pages
    4 Above 500 pages.

82 Anatomy

Viewed from the angle of binding, a book is a a chain of 11 links. It is a symmetrical link with paper as the central link. The following diagram gives a schematic representation of the book as such a symmetrical link.



The diagram discloses the parts of a bound book, which get attention while binding. It is a truism that the strength of a chain is determined by that of its weakest link. This means that it is uneconomical to make any of the other links more durable than the weakest one. Of the 11 links, the paper on which the book is printed has to be accepted by the librarian and the binder. It therefore follows that the quality of the materials used to form the remaining links should be commensurable to the durability of the paper of the book bound. In particular, in the case of ephemeral books on poor paper, binding can use cheap materials and it can be done cheaply. Again for a book printed in weak antique or featherweight paper which will perish soon, binding can be done cheaply. A book printed on art paper is a problem. If it is only of ephemeral value, its binding can be done cheaply. If it happens to be a book of permanent value, special and often costly methods should be adopted in binding it. One method is to provide strong paper or linen guards (see section 861) for each section—both inside and outside it—and sew the sections through these guards.

Let us examine each of the links in the chain forming the book. We shall start from the centre and proceed outwards. We assume that the book will have to stand much wear and tear and will have to last.

821 PAPER

If paper is weak, each section must be guarded as prescribed in the last section, before sewing is done. We have already dealt with "edition binding" in chapter 5. When individual books are to be bound in a library, the first task is to unstitch the volume, collate it, re-arrange misplaced signatures and supply missing signatures, if possible.

822 THREAD

The thread used for sewing must be strong and durable. It should not injure paper at any time. Wire thread may be strong. But it will rust. Therefore it is not durable. Further when rusting begins, the rust will disintegrate the paper. Bleached thread —cotton or linen—will be soft to handle. But the process of bleaching invariably diminishes the strength of the thread. Thus, unbleached thread of suitable thickness is indicated. Whether it should be of cotton or linen depends on the quality of the paper on which the book is printed. Nylon thread has been put into the market. It has not yet been tested sufficiently to gain general acceptance.

823 TAPE

The tape round which the thread is taken and against which the signatures of the book are stitched must be of the best unbleached linen, for heavy books of permanent value. For books of the next order of importance, hempen cords may be used instead of linen tapes.

824 END-PAPER

End-paper is the extra fold of papers which are sewed along with the sections at the beginning and end of the book. It serves three purposes. It bears the brunt of the strain when the book is opened and closed. It covers up the inside of the board which will otherwise be unsightly. It also prevents the first and the last few leaves of the books from crumpling by use. To be fit for all these functions, end papers must be of good, thick, strong paper. It must have stout linen joint and must be sewn on as a section.

825 BOARD

The board is the foundation of binding. If it cracks, warps or breaks, the covering material will wear out very fast. It is therefore necessary that a strong, thick, hard mill board should be used. Black board made from old rope is the best. Machine-made grey boards come next in order. Straw-boards should be used only for least used books.

826 COVERING MATERIAL

A variety of covering materials is available. They fall into two classes: Leather and woven textile fabric. Leather is nature's product and can not be hurried. With the phenomenal increase in the number of books, the world's output of leather for binding has become too inadequate. The pressure of this fact led to the adoption of cloth as covering material in the nineteenth century. Leather should be used for heavy, oft-used and fairly permanent books and cloth may be used for others.

8261 Leather

Quality in leather is the resultant of (1) tightness and length of fibres (2) durability of surface and (3) the natural fat or oil content. The structure of the leather determines strength. Durability depends on the climatic environment of the animal. Animals in temporate and tropical regions which have developed short hair excel those in colder zones, where the vitality of the animal is expended in the development of hair as protection against cold. For example, the leather of the Cape goat of South Africa is inferior to that of the Nigeria goat. In general, the leather from a mature animal should be preferred. Excess of oil makes leather creasy. It is therefore naphtherised *i.e.* dried and then revitalised.

The leather should be vegetable-tanned—say with sumac or mimosa. Acid-tanned leather should be severely avoided.

It is the layer below the surface that is fibrous and tough. The thickness of the leather should not therefore be unduly reduced or pared.

The following are the kinds of leather available.

1 Goat-skin, usually called morocco is the best, if it is of tropical goats. It has a strong net-work of grain. Moulds can be taken of its grains and soft sheep leather

can be given the grain by pressure in these moulds. This fraud can be detected by scratching the leather with the finger-nail. Morocco is the leather to be prescribed for general use in books.

2 Pig-skin is very strong if it is alum-dressed and not unduly de-greased. It may be prescribed for books of special value.

3 Sheep-skin is cheap but very weak. It should not be used for library books.

4 Calf-skin resembles goat skin in structure. Though basically strong, it is not durable. Because they have a smooth surface, it has been largely used. It is believed that the so-called calf-skins found in older books are really skins of maturer animals. But it should not be prescribed for library books.

5 Greenland seal-skin is very strong. Its richness in oil makes it flexible as well as durable. But it is too costly for library use.

6 Kangaroo-skin is becoming popular.

7 Skins of snake, lizard and crocodile are occasionally used in binding private books. I saw in Boston Athaeneum Library a book bound in human skin. I was told that it was so bound according to the will of the owner of the book who had stipulated that it should be bound in his own skin. These do not count for library binding.

8262 Woven Fabric

Leather is too expensive for the great majority of books. Woven fabric is therefore commonly used for books that are either not permanent or not of much uſe and therefore need not stand much wear and tear. The following are the fabrics that may be used. They are arranged in decreasing order of strength and durability. There is a great variety of book-cloth available now. Colour, beauty of finish and capacity to take tooling should be looked for.

1 Linen buckram is the strongest. It has a smooth surface. It is stiff and therefore not suitable for small books. It is naturally the most costly textile used in library binding.

2 Leather cloth is really proxylin-treated book cloth. It is said to be water-proof and smudge-proof unlike starch-filled book cloths.

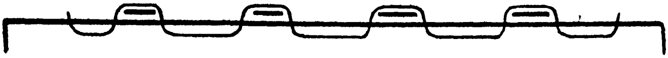
3 Cotton cloth may be used for the front and back, but not for the spine. It is called calico.

83 Process

Next to the use of right materials the right process must be insisted upon. The chief stages in the process are: (1) Sewing, (2) Trimming, (3) Rounding, (4) Backing, (5) Attaching to the board, (6) Covering and (7) Tooling.

831 SEWING

Sewing is the very essence of binding. The sewing must be done one sheet on. There should be three to six tapes.



As shown in the accompanying diagram, the single thread is carried through the fold of the section of the end-paper and round the tapes from head to tail. At the end of the section it is taken across to the next section by a "kettle-stitch" and then upto its head. The thread is thus carried up and down across the entire back of the book and through the end paper at the second side. This is "flexible all-along sewing". While this must be done for the strongest work, sewing two sheets on may be allowed for the majority books.

When the book is cut from the sewing frames, about one or two inches of the tape are left projecting from either side of the book. These are later to be inserted into the board. These are called "slips".

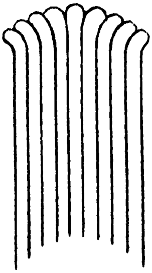
832 TRIMMING

The edges of the leaves are cut with the "plough". It is not usual to cut old and valuable books. The edges should be sparingly trimmed in other cases.

833 ROUNDING

The process of sewing increases the thickness of the back of each section by the thickness of the thread. Some of this additional thickness may sink into the paper and yet there will be an appreciable amount of swelling at the book. The book will therefore have the shape of a trapezium instead of a rectangle. This must be set right.

The only method, as shown in the accompany-diagram, is to round the back. This is what geometry suggests. A straight line gives the shortest distance between two points. If they are to be connected by a longer line, it must be a curved line.



ROUNDING

The back of the book is first knocked flat and covered with thin glue well worked between the signatures. Before the glue becomes too hard, the back is tapped with a hammer until it takes an even convex form. This is "rounding".

834 BACKING

After rounding, the book is held between wedge-shaped "backing boards". Over the edge of these boards, the backs of the sections are tapped and fanned out evenly. The result is that a groove is formed at the front and the back, so as to receive the boards. The result of this is that the edges of the joint are slightly higher than the total of the bulk of the book plus the thickness of the boards.

835 ATTACHING THE BOARD

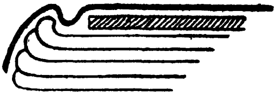
In re-inforced library binding split-board is used. This is made by two mill-boards—one thick and the other thin—being glued together, with the thin board closer to the book. About an inch of margin near what corresponds to the spine of the book is left unglued. That is why it is called split-board. The slips, *i.e.* the loose ends of the tape, are laid with glue between split boards. It is also usual to cut away the outer of the four leaves of the end paper so as to leave only a width of about an inch and lay it with glue along with the tapes between the split boards. The second leaf is then pasted down on the inside of the board.

8351 Squares

Squares are the projections of the boards beyond the edges of the leaves. The squares should be of even width and generally about as deep as the thickness of the covered board.

8352 French Joint

The greatest strain is experienced by the covering material at the joint between the board and the book. The covering material must therefore be strengthened at this joint. We cannot make it thicker along the thin line of the joint alone. The only alternative is to increase the area of the covering material at the joint. This is done by leaving a small space between the back edge of the board and the groove made by the backing. This is "French joint". The covering material is driven into the groove, as shown in the accompanying diagram. This gives a greater area of the covering material to stand the strain of closing and opening the book.



FRENCH JOINT

8353 Tapeless Attachment

During the last decade when the Second World War was on, there was a scarcity of tapes. Again necessity became the mother of invention. Tapeless attachment is now coming into vogue. The back of the book is lined with strong mull. A good durable and flexible adhesive is used to secure the mull to the signatures on the one hand and the boards on the other. The mull should come as near to the head and tail of the book as possible since the strain is greatest just at these points, when the book is used. The mull should be so placed that the warp—the strongest threads—is across the book and not down it.

836 COVERING

Covering of the board is usually done before the book is attached, if a woven fabric is used as the covering material. Leather is usually applied after the book is attached to the board.

If the edges are to be guilded or coloured, it should be done before covering is begun.

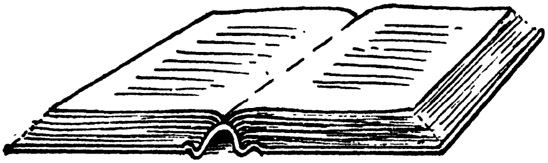
If head-bands are to be used, they too should be inserted before covering is begun. These should be a little lower than the height of the squares. Head-bands are worked in silk by a kind of "buttonhole-stitch" enclosing a strip of leather or gut. They help in protecting the leather of the head from being pulled away from the back when books are taken from the shelves. Instead of a head-band, the leather at the head may be turned in over a strong cord.

8361 Sides

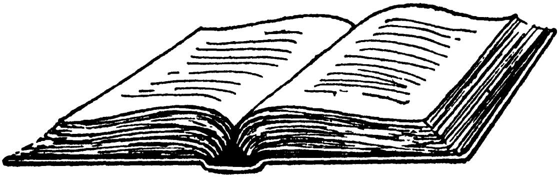
The leather is pared and softened with flour paste and then applied to the sides. The parts of the leather that turn over on to the inside of the board are mitred at the corners and trimmed evenly. The end-paper pasted on the inside of the board should be of the same thickness as the leather turned in. This is full-binding.

8362 Spine

The spine on the back of the signatures may be lined with a sheet of paper or muslin or similar tape-like material. This is called "stripping". In "back-stripping", the tape is folded round the spine of the book. In "flat-stripping", it is not so folded round. The covering material should be firmly pasted down the spine. This is called "tight back" or "flexible back". In "hollow back" the covering material does not touch the spine. It is called hollow back because when the book is kept open, one can see down between the back of the book and the back of the board. In tight back binding, the strain is distributed over the whole spine. But in hollow back binding, it is all thrown over the joints.



FLEXIBLE BACK



HOLLOW BACK

8363 Half-Binding

Much of leather and of the cost of binding may be saved by "half-binding". In this, the leather is applied only on the spine, round the spine and on to the sides only to about an inch end at the corners. When these are dry, the rest of the surface of the sides is covered with cloth or paper.

837 FINISHING

The essential part of "finishing" consists of "lettering" and "decoration". Lettering consists of author's name, title, date and call number. This is essential. The position for these items on the spine and the use of gold or otherwise has been already discussed in chapter 4. Decoration is hardly necessary in the majority of library books. This has been discussed in chapter 3.

84 Faults

In library binding certain faulty processes should be guarded against. Hollow-back is a fault which has been already mentioned. Too much paring of leather is another fault which has been already mentioned.

841 SEWING

There are some faulty methods of sewing which should be prevented with care. These are enumerated below:

1 "Sawing in" consists in sawing trenches across the backs of the signatures for the cords to lie in. This is done to avoid appearance of ridges on the spine after it is covered.

2 "Stabbing" is sewing by piercing the signatures from front to back. If stabbing is done, the book will not open to the back, will not lie open and will tear at the sewings.

3 "Stapling" is stabbing with wire. It may also denote sewing through the folds with wire thread. The harmfulness of the use of wire has already been mentioned in section 822.

4 "Tipping-in" is pasting the edge of a single leaf to the next leaf. Plates are usually tipped in publisher's casing.

842 "PERFECT" BINDING

"Perfect-binding" is a misleading if not a pretentious term. In this process, there is no sewing whatever. The backs of the signatures are cut off leaving single leaves only. About a hundred years ago, the leaves were fixed together by caoutchouc. Later naptha solution and rubber latex and other adhesives were used in succession. The advantage is that the book opens quite flat. The fault is that the binding appears to be strong enough at the beginning but that before long the adhesive perishes and the leaves fall out. The main difficulty is that chemical technology has not yet found an adhesive capable of penetrating into the edge of the paper to keep the leaves together in the place of the cut fibres.

843 BLEEDING

Bleeding is cutting the edges too much so as to affect the reading matter. This must be avoided.

85 Preservation

A knowledge of the above details about the process of binding and the materials used will be of help to the maintenance section of the library staff. The binding is the armoury of the book. It is the most exposed part of the book. Any injury to the book must enter it through the binding. Preservation of the book therefore centres largely round preservation of the binding. The first duty of the maintenance section and the reference section in an open access library is to train readers in pulling out a book from the shelf in a gentle way. In particular they should be trained not to pull out the square of the leather on the spine projecting at the head. The head-bands should not mean a licence to pull out the head of the covering of the spine of the book.

In the case of very big and heavy books in frequent use, it is advisable to have a strap of leather going loosely across the back and each end, fastened to the board of the book.

The following prophylactic measures should be adopted by libraries in order to preserve books in a good condition.

851 OVER-SIZED BOOKS

Over-sized books should be made to lie on their sides. If they are made to stand on their edges, the binding and the leaves bend and the book loses its shape. If the book is heavy, this may also weaken the attachment of the book to the board and eventually affect the sewing also.

852 WARPING

Warping of the cover is one of the ailments to which books are prone. It makes books unsightly to see and unruly to handle. Everybody agrees that moisture is the responsible snake in the grass. But there is a wide disagreement as to just what is "the grass" the snake is hiding in. Moisture likes the adhesive. It is conceded to be in the board. It is agreed that it can find shelter in the pores of the cloth and the paper. All agree that all these materials can absorb moisture and absorb it unequally. It is found that 60% water content is ideal. If it is less, the end-paper is unable to overcome the pull of the cloth and outward warping sets in. If it is more, inward warping sets in. Waterless adhesive is talked of. Long retention of the book in the press until the book is quite dry and flat is said to be somewhat preventive. The ideal is air-conditioning so that the stack-room is always maintained at a humidity of 60%.

853 LEATHER

The leather on the binding of books frequently handled lasts very much better than books left untouched. The natural grease from the hand keeps the leather fit. Periodical application of a mixture of paraffin wax and castor oil will prove useful—very much as we do with leather shoes. Shoes put away for a long period crack and become hard and brittle. Open access and occasional oiling will make leather binding ever-lasting.

854 MILDEW

A group of omnivorous fungus known as mildew or moulds is destructive of paper and leather. They are recognised by the white scars they produce. It grows much when humidity is above 70% and most when it reaches 90% and the temperature is between 77° F and 100° F. Ventilation controls moulds to some extent. To provide for aeration, books must be loosely arranged on shelves. In winter, steel shelves cause local lowering of temperature producing near the books pockets of more humid air.

855 BOOK-WORM

Book-worm is the popular name for the larva of beetles. It eats paper and leaves its eggs on the surface of binding or on the edges of books. The eggs hatch within ten days during summer. The larva eats its way into the interior of the book and reaches the surface again when ready for chrysalis stage. It has about five life-cycles in a year. Its damage is recognised by the pinholes and tunnels across the leaves of books.

856 SILVER-FISH

Silver-fish has glistening silver-grey scales on the body, long antennea on the head and filaments at the hind-end. It is less than half an inch in length. It hides away all day and feeds on binding, starch and paper at night and in darkness.

857 COCKROACH

It is found from experience that cockroaches and other insects are attracted to gnaw into the binding if the colour of the covering material is dark or deep-green or anything bordering on darkness. On the other hand, red colour seems to have least attraction for them.

858 PREVENTIVE

The mixing of copper sulphate in the paste and the glue acts as a preventive against insects.

86 Mending

If the sheets are too damaged, re-sizing, washing and mending may have to be done. Dust and surface dirt should be removed by rubbing gently with soft India-rubber from the centre of the page to the outside. If rubbed in the reverse direction, the paper may be creased or torn. Re-sizing should be done after this. It will remove stains due to damp and make the paper crisp and firm.

861 GUARDING

All damaged folds should be guarded. Guarding is the process of laying over the back of the section a strip of strong, thin and flexible paper or linen. The strip is the guard. The guard will hold the thread which would otherwise cut the paper.

862 OVER-CASTING

If the sheets of a book are cut into single leaves, these must be made up into sections by guarding each adjacent pair of leaves or by over-casting. Over-casting is sewing not through the folds but by piercing the sections from front to back.

863 BRITTLE PAPER

Paper which has become brittle in rare and valuable books which should be preserved at any cost, each leaf may have to be cased in transparent silk-gauze, guarded and then sewed. Considerable research is being made into preservation and mending, in archival libraries. This is but natural since archives are unique materials whose value consists essentially in the authenticity of the original material. No copy can take the place of the original. Though library books are not generally in need of such meticulous treatment, some of the practices of archives may be of use in libraries.

87 India

India had been for long very backward in binding. The ritual revulsion to handle leather perhaps added to the neglect of leather-binding. But the main cause has been the exhausted resting stage of the community for some centuries. As we saw in chapters 1 and 2, paper-making and printing were slow to develop. They were prematurely introduced by foreigners when the country was virtually sleeping.

But it has now come back to active life. The movement towards universal compulsory education for children and social education for adults will soon make books essential and essential in vast numbers. Libraries will begin to sprout here, there and everywhere with great rapidity. It has been my dream and my wish, as I have shown in my *Library development plan* (Delhi University Publications, library science series, 2), 1950, and in my *Library tour* (Indian Library Association, English series, 1), 1950, that library movement should put on full steam in about 30 years. By 1980 then the country should be covered by a nation-wide library-grid. Every citizen will have a library within his walking distance—either stationary or mobile. The rate of book-production will be colossal. To bind them for use, will be a huge task. India should prepare itself for this task from now on. Our Planning Commission should provide for this timely preparation.

871 TECHNOLOGISTS

Mill-boards must be manufactured. We have a reputation to make excellent binding leather. We must increase the output. We must experiment on cover-cloth and turn some of our promising young textile technologists on this task. So also we should promote research into glue technology.

872 ENGINEERS

Our engineers should turn their attention to the machinery for binding. They must, of course begin with importing. But they should soon improve on them and produce their own designs of greater efficiency.

873 SELF-SUFFICIENCY

Our Planning Commission should aim at self-sufficiency in all matters connected with Social Bibliography. They should implement this aim by providing for research in every detail of Physical Bibliography. Our library profession should co-operate with engineers, technologists, psychologists, educationists and statesmen to explore the full needs of Social Bibliography.

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The numbers given are those of the chapters or sections concerned.

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desc=described
i.r.t.=in relation to
q.i.r.t.=quoted in relation to
r.i.r.t.=referred in relation to

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